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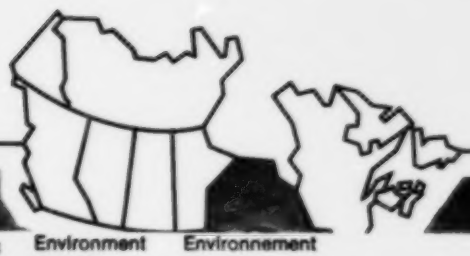
The 1982 Spruce Budworm Situation in Ontario

Part A: Damage and Forecasts

Part B: Aerial Spraying Operations

J. H. Meating, H.D. Lawrence, G.M. Howse and J. R. Carrow

Information Report O-X-349
Great Lakes Forest Research Centre



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THE 1982 SPRUCE BUDWORM SITUATION IN ONTARIO

PART A: DAMAGE AND FORECASTS

PART B: AERIAL SPRAYING OPERATIONS

J.H. Meating, H.D. Lawrence,
G.M. Howse and J.R. Carrow[1]

GREAT LAKES FOREST RESEARCH CENTRE

CANADIAN FORESTRY SERVICE

DEPARTMENT OF THE ENVIRONMENT

1983

INFORMATION REPORT O-X-349

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Corrigendum to Information Report O-X-349 "The 1982 Spruce Budworm Situation in Ontario"

page 1, paragraph 1, column 2, line 5 should read: "Another 2.004 million m^3," *not* "16.619 million m^3".

The figure 16.619 million m^3 represents total losses in 1982, and consists of 14.615 m^3 of tree mortality and 2.004 m^3 of growth loss.

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ABSTRACT

Over all, the spruce budworm situation continued to improve in Ontario in 1982. The area of infested stands and high population levels declined considerably in northeastern and southern Ontario, but there were increases in northwestern Ontario. Part A of this report describes changes in the infestations in 1982 and forecasts, in cartographic and tabular form, the damage liable to occur in 1983. Part B describes aerial spraying operations covering 3454 ha which were conducted against the spruce budworm in 1982.

RÉSUMÉ

En 1982, le recul de la tordeuse des bourgeons de l'épinette s'est généralement poursuivi en Ontario. La superficie infestée et les effectifs denses ont considérablement diminué dans le nord-est et le sud de l'Ontario, mais ont augmenté dans le nord-ouest. La partie A du rapport décrit l'évolution des infestations en 1982 et présente, sous la forme de cartes et de tableaux, un aperçu des dommages prévus pour 1983. La partie B décrit les épandages aériens réalisés contre la tordeuse, sur 3454 ha en 1982.

ACKNOWLEDGMENTS

We wish to acknowledge the cooperation of the Ontario Ministry of Natural Resources in providing the Forest Insect and Disease Survey Unit with aircraft, student help and various facilities.

We also wish to acknowledge the assistance of the following Survey field technicians who made a major contribution to this report through their observations, aerial mapping and procurement of data:

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We wish to remind all management and unit foresters, industrial or provincial, that if they require more specific information than is contained in this report about spruce budworm conditions in their districts they should contact the appropriate Survey field technician or write to the Head, Forest Insect and Disease Survey Unit, Great Lakes Forest Research Centre.

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PART A: DAMAGE AND FORECASTS

INTRODUCTION

Since 1967, when the current outbreak began, the spruce budworm *(Choristoneura fumiferana* [Clem.], has been Ontario's most destructive forest pest. In 1982, despite a dramatic decrease in the size of the infestation, a total of 8.023 million ha suffered moderate-to-severe defoliation (Table 1, Fig. 1). The area in which budworm-associated tree mortality occurs continued to expand in 1982 and now totals some 11.634 million ha (Table 2, Fig. 2). According to updated impact estimates, depletion of primary growing stock, as a result of tree mortality alone, totalled some 78.735 million m^3 up to the end of 1982. Another 16.619 million m^3 were lost as a result of reduced growth (current annual increment) in 1982.

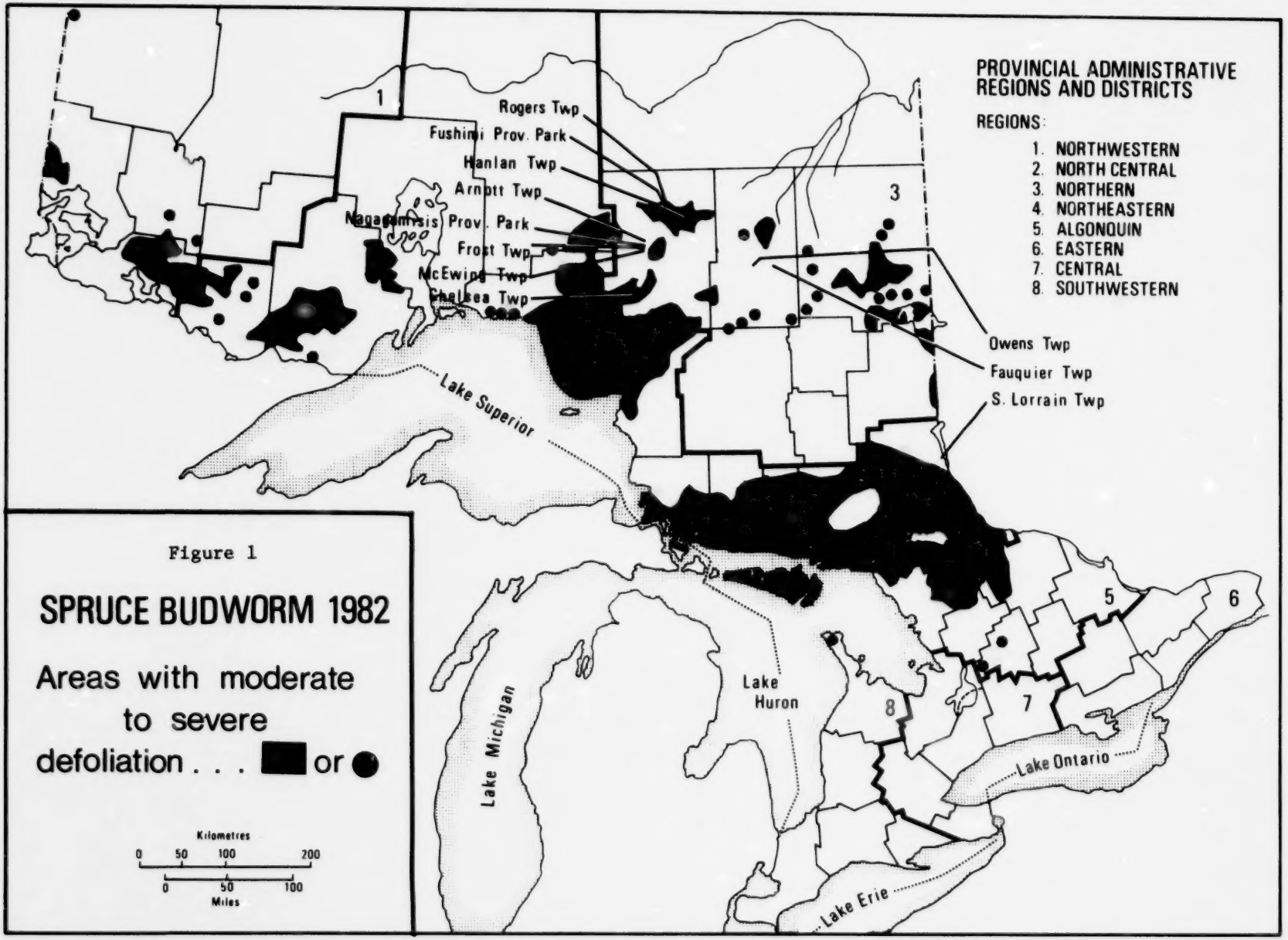
The primary hosts of budworm in Ontario are balsam fir *(Abies balsamea* [L.] Mill.), white spruce *(Picea glauca* [Moench] Voss) and black spruce *(P. mariana* [Mill.] B.S.P.) growing on upland sites in mixed stands, usually in association with balsam fir. Feeding damage (defoliation) by spruce budworm larvae is most

Table 1. Comparison of the area of forest in Ontario defoliated by spruce budworm in 1981 and 1982.

Outbreak region	Gross area of moderate-to-severe defoliation (000,000 ha)		
	1981	1982	Change
Northwestern	.658	.931	+ .273
Northeastern	16.958	6.669	- 10.289
Southern	.601	.423	- .178
Total	18.217	8.023	- 10.194

Table 2. Comparison of the area of budworm-associated tree mortality in Ontario in 1981 and 1982.

Outbreak region	Gross area of budworm-associated tree mortality (000,000 ha)		
	1981	1982	Change
Northwestern	0.088	.150	+ .062
Northeastern	9.572	9.934	+ .362
Southern	1.550	1.550	0
Total	11.210	11.634	+ .424


PROVINCIAL ADMINISTRATIVE REGIONS AND DISTRICTS
REGIONS:
1. NORTHWESTERN
2. NORTH CENTRAL
3. NORTHERN
4. NORTHEASTERN
5. ALGONQUIN
6. EASTERN
7. CENTRAL
8. SOUTHWESTERN
Rogers Twp
Fushimi Prov. Park
Hanlan Twp
Arnott Twp
Nagagamisis Prov. Park
Frost Twp
McEwing Twp
Chelsea Twp
Owens Twp
Fauquier Twp
S. Lorrain Twp
Lake Superior
Lake Michigan
Lake Huron
Lake Ontario
Lake Erie
Figure 1
SPRUCE BUDWORM 1982
Areas with moderate to severe defoliation . . . or
Kilometres
0 50 100 200
0 50 100
Miles

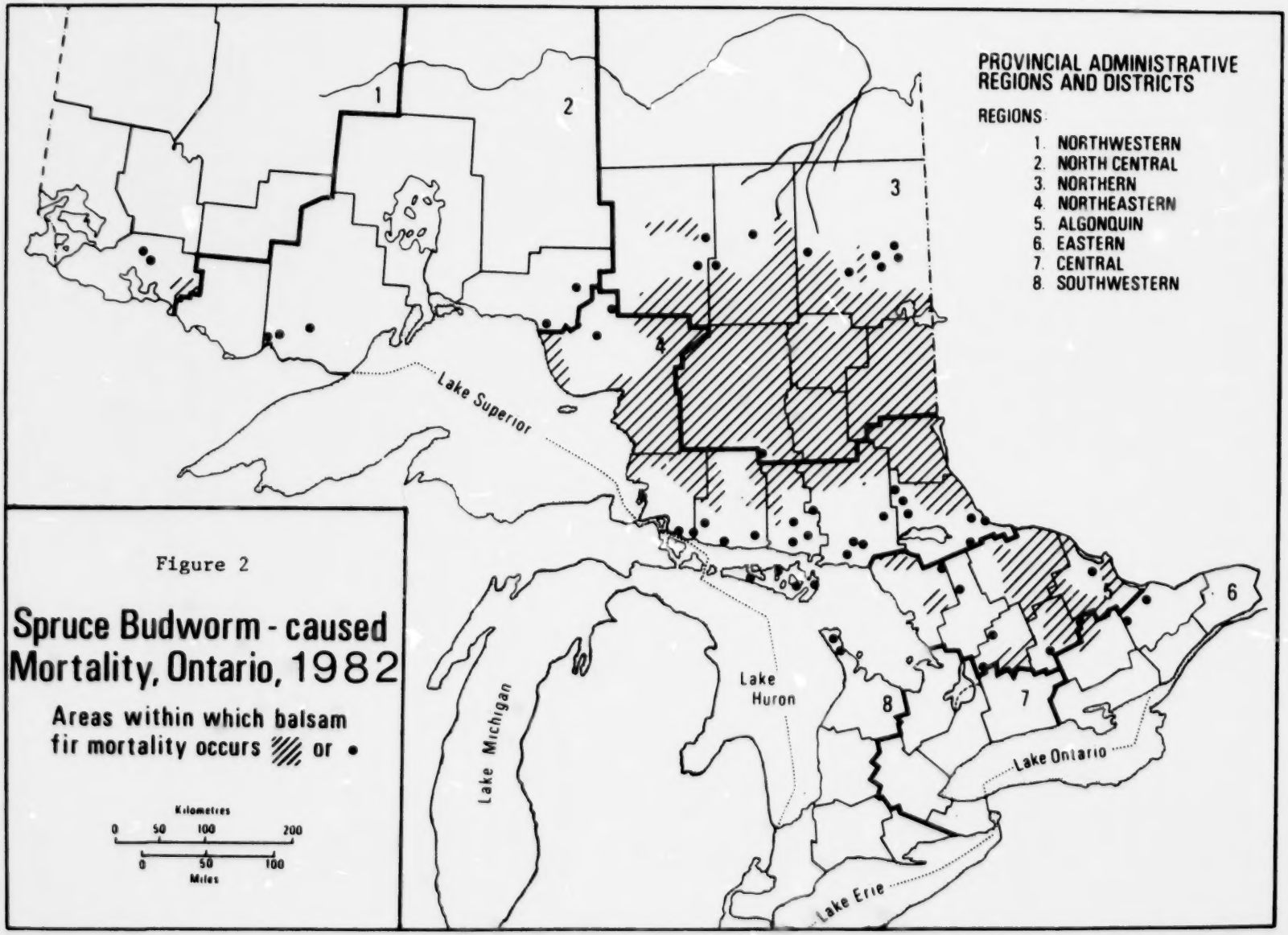


Figure 2

Spruce Budworm - caused Mortality, Ontario, 1982

Areas within which balsam fir mortality occurs ▨ or •

prominent from early to mid-July when aerial surveys are conducted for the purpose of detecting and mapping the extent of defoliation. These aerial surveys are supported by ground checks wherever possible. Figures presented in this report describing areas affected by budworm actually represent gross areas within which stands containing one or more of the major host species show moderate-to-severe current defoliation.

Three separate infestations became evident in 1967 and each has followed a different pattern over the years. The outbreak in southern Ontario has gone through periods of increase and decline and is at present on the decline. The infestation in northeastern Ontario, which peaked in 1980, is also on the decline. In northwestern Ontario, where the budworm populations have behaved differently than in the east, the infestations are currently increasing.

In 1971, the first of what has developed into an annual series of reports on the status of the spruce budworm in Ontario was prepared by the Forest Insect and Disease Survey (FIDS) Unit of the Great Lakes Forest Research Centre (GLFRC) in Sault Ste. Marie. The purpose of these reports is to provide forest managers with information about Ontario's most important forest insect pest on a province-wide basis. This report, the thirteenth in the series, describes the 1982 spruce budworm situation in Ontario and provides damage forecasts for 1983. As well, the best available information, data and maps describing budworm-caused tree mortality as of 1982 are included.

In this report the province has been divided into four geographical regions: southern Ontario includes the Algonquin, Eastern, Central and Southwestern regions of the Ontario Ministry of Natural Resources (OMNR), northeastern Ontario includes the Northern and Northeastern regions, north central Ontario includes Terrace Bay, Geraldton and Nipigon districts and northwestern Ontario includes Thunder Bay, Atikokan, Fort Frances, Ignace, Dryden, Sioux Lookout, Kenora and Red Lake districts. Areas of defoliation and tree mortality presented in tables 1 and 2 originally represented individual infestations that began in southern, northeastern and northwestern Ontario about 1967. Eventually the infestations in southern and northeastern Ontario fused into a single body. As well, the northeastern infestation expanded into Terrace Bay and Geraldton districts. This portion of the infestation is covered in the 'North Central Ontario' section of this report as is the area of the Poshkokagan Lake infestation that expanded into Nipigon District from Thunder Bay District.

OVERALL SITUATION, 1982

Temperatures remained cool during April following a severe winter. Warmer than normal temperatures in early May resulted in budworm emergence during the first week of May in the vicinity of North Bay and during the second week of May near Hearst. Budworm larval development proceeded somewhat ahead of normal during the latter part of May and early June. The latter part of June was cooler than normal, and indeed was the coolest June on record for some locations in Ontario. As a result, budworm development reverted to normal or slowed to less than normal.

Results of the egg-mass survey conducted in August and September,

1982 are used to forecast population trends and expected damage from larval feeding in 1983. This year, egg counts and defoliation estimates were obtained from 623 locations throughout the province: 103 in southern Ontario, 309 in northeastern Ontario, 66 in north central Ontario and 145 in northwestern Ontario. As in previous years, FIDS staff placed considerable emphasis on sampling 'high-value' stands (seed production areas, plantations, nurseries, provincial parks, etc.) as suggested or requested by OMNR. In 1982, unlike the previous two years, egg-mass counts showed an overall increase of some 12%, although there were declines in three of the four geographic regions sampled. In each case an index of accumulated damage is included with the egg-mass survey data. This index is an attempt to incorporate cumulative defoliation, top mortality and tree mortality into a classification that describes the condition of the stand.

Major changes occurred in the spruce budworm situation in Ontario in 1982 (Fig. 1). The overall area suffering moderate-to-severe defoliation in 1982 totalled some 8.023 million ha, a decrease of slightly more than 10 million ha from 1981. Aerial and ground surveys conducted by the Canadian Forestry Service (CFS) showed that, on a regional basis, infestations declined in northeastern and southern Ontario and increased in northwestern Ontario. By far the largest decline was recorded in northeastern Ontario (Table 1). These results were generally in line with forecasts made on the basis of egg-mass counts in the fall of 1981 which indicated reductions in the 50% range in northeastern and southern Ontario and an overall increase of more than 100% in northwestern Ontario. A comparison of the area of budworm defoliation in 1981 and 1982 is presented on an OMNR district basis in Table 3.

Aerial surveys are carried out, with flying time provided by OMNR, from early to mid-July when the distinctive color of budworm-damaged white spruce and balsam fir is at its peak. Further ground examinations are then made to check on aerial observations. As expected, the area of budworm-associated tree mortality continued to increase in 1982. The extent of tree mortality in 1982 is compared with that in 1981 in Table 2. A total of 11.634 million ha of tree mortality was mapped this year (Fig. 2).

Southern Ontario

Situation in 1982: In southern Ontario, the infestation decline, which began in 1981, continued in 1983, with an overall decrease of 177,942 ha in the area of moderate-to-severe defoliation (Fig. 3). Changes around the edge of the main body of infestation resulted in a decline of 150,650 ha in the Parry Sound, Bracebridge and Algonquin Park districts. Some 31 scattered pockets of medium-to-heavy infestations totalling 4,822 ha remained in the southern Bracebridge and Minden districts. Spruce budworm populations were down significantly throughout the Eastern, Central and Southwestern regions of southern Ontario in 1982. Indeed, only two small pockets of medium-to-heavy infestations persisted in St. Edmunds Township, Owen Sound District, along with a single area of medium infestation in West Oxford Township, Aylmer District. Elsewhere in southern Ontario populations were low and damage was negligible.

Table 3. Comparison of spruce budworm defoliation in 1981 and 1982 in the OMNR administrative districts.

Region and District		Area of moderate-to-severe defoliation (ha) 1981	1982
Southern Ontario[a]	Algonquin Park	126,492	119,245
	Bracebridge	184,585	141,822
	Carleton Place	2,192	0
	Lindsay	987	0
	Minden	14,249	3,726
	Owen Sound	2,412	220
	Parry Sound	258,683	158,044
	Tweed	11,399	0
		600,999	423,057
Northeastern Region	Blind River	735,493	655,627
	Espanola	875,796	788,900
	North Bay	924,792	895,026
	Sault Ste. Marie	510,570	299,865
	Sudbury	1,010,837	950,670
	Temagami	605,631	291,755
	Wawa	1,692,840	1,421,293
		6,355,959	5,303,136
Northern Region	Chapleau	1,892,990	438
	Cochrane	2,071,623	263,922
	Gogama	716,899	22,578
	Hearst	1,845,414	349,100
	Kapuskasing	1,459,946	64,794
	Kirkland Lake	1,261,183	62,691
	Moosonee	45,692	b
	Timmins	731,925	0
		10,025,672	763,523
North Central Region	Atikokan	82,975	124,286
	Geraldton	187,500	141,699
	Nipigon	3,946	24,988
	Terrace Bay	389,011	460,711
	Thunder Bay	302,966	439,058
		966,398	1,190,742
Northwestern Region	Dryden	0	11,618
	Fort Frances	264,383	300,742
	Kenora	3,289	30,469
	Red Lake	200	200
		267,872	343,029
		18,216,900	8,023,487

[a]Southern Ontario includes Algonquin, Eastern, Central and Southwestern regions

[b]Not surveyed in 1982

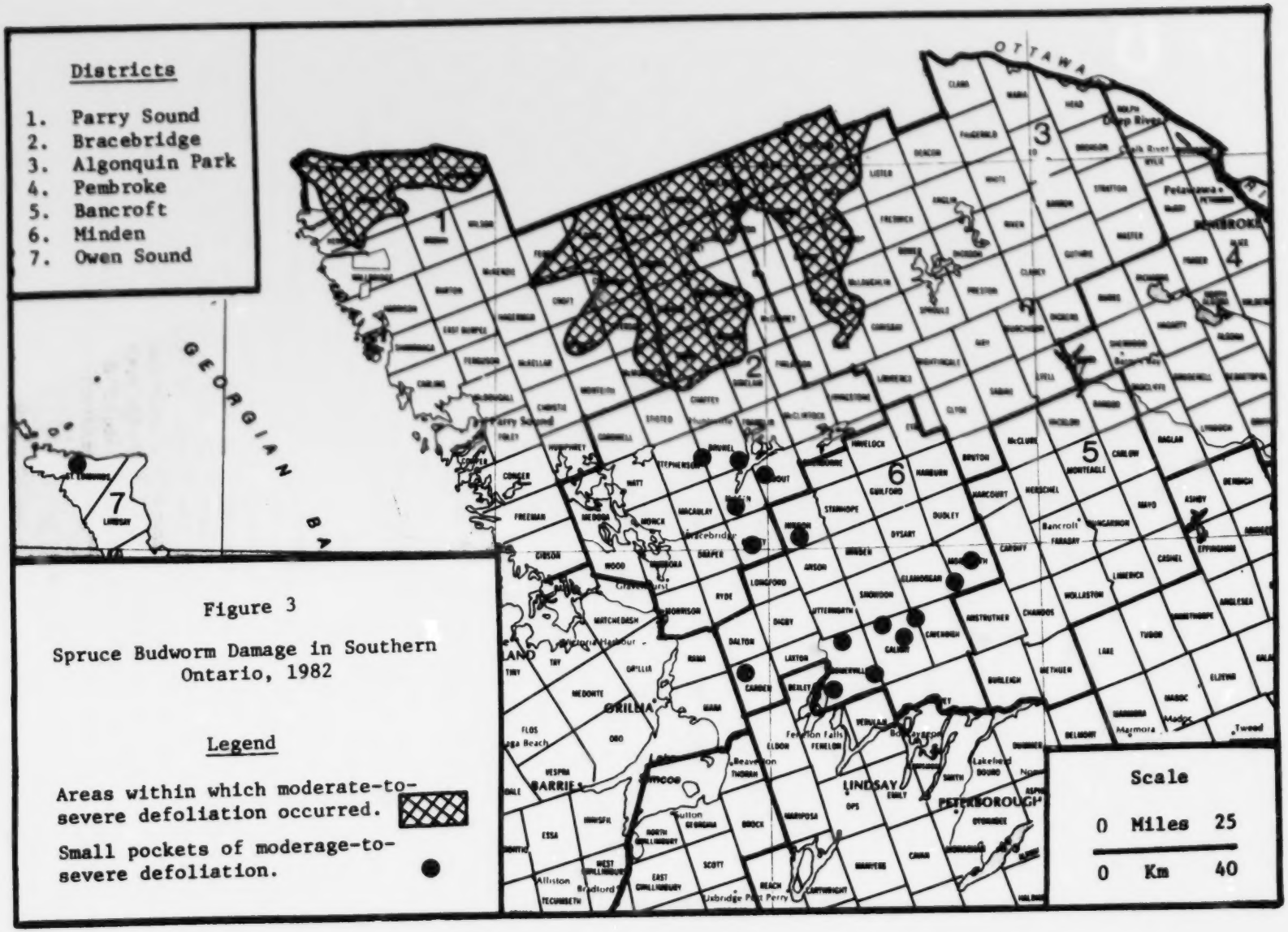


Figure 3

Spruce Budworm Damage in Southern Ontario, 1982

In the Algonquin Region, the largest decline occurred around the edge of the main infestation in Parry Sound District where the area of infestation went from 258,700 ha in 1981 to 158,000 ha in 1982. Most of this decrease occurred in McKenzie, Hagerman, McKellar, Christie and Monteith townships. In Algonquin Park District, although the area of moderate-to-severe defoliation declined slightly from 126,492 ha to 119,200 ha, new infestations were observed in Hunter, Peck and Canisbay townships. In Bracebridge District the total infested area declined by 23% to 141,800 ha in 1982, with reductions in the area of the main infestation, particularly in Chaffey and Stisted townships, and in the total number of small pockets of defoliation. Some 21 pockets totalling 3,700 ha were moderately defoliated in Minden District.

Infestation Forecasts for 1983: Spruce budworm egg-mass surveys were carried out in southern Ontario during late July and early August, 1982. Foliage samples were collected from a total of 103 locations; egg masses were counted, current defoliation and accumulated damage were estimated and damage forecasts were prepared for 1983 (see Table 4 and Figure 4 for area forecasts).

When counts for 92 locations sampled in 1981 and 1982 were compared, egg-mass densities showed an overall decrease of 17% in southern Ontario. The largest decreases occurred in Minden (85%), Brockville (77%), Bancroft (72%) and Parry Sound (70%) districts with smaller decreases in Aylmer, Maple, Owen Sound, Simcoe and Wingham districts. Small increases in egg-mass density occurred in all other districts except Bracebridge and Algonquin Park where counts more than doubled.

On the basis of a comparison of 31 locations sampled in 1981 and 1982 the average egg-mass density on balsam fir increased by about 12% to 40 per 9.29 m^2 of foliage. White spruce, on the other hand, showed an overall decrease of 22% to an average of 65. The highest single count was 679 on white spruce in the Pickerel Lake area of Bracebridge District.

This is the third consecutive year that egg-mass numbers have declined in southern Ontario, and as a result, forecasts call for a further reduction in the area of infestation in 1983. Generally, defoliation is expected to be trace to light with scattered small pockets of moderate to severe. The main infestation in Parry Sound, Bracebridge and Algonquin Park districts will likely continue to decrease in 1983.

Tree Mortality: In southern Ontario the area of budworm-associated tree mortality did not change in 1982, but was still observed within an area of about 1.550 million ha (Fig. 5). While the proportion of dead trees is quite variable between stands, balsam fir mortality in the stands checked in 1982 ranged from 55% to 100% in most districts. The exception was in Tweed District where balsam fir mortality in the surveyed plots currently averages 25%. The same variability exists in white spruce stands, with mortality levels ranging from 9% in Bracebridge District to a high of 82% in Minden District. A summary of all tree mortality data, based on ground checks for the last eight years, is presented in Table 5. In terms of volume loss, it has been estimated that, up to 1982, a total of some 11.316 million m^3 of wood, principally balsam fir and white spruce, have been lost as a result of tree mortality in southern Ontario.

Table 4. Southern Ontario - Spruce budworm: summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983.

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Algonquin Park District (16 locations)					
Airy Twp - East Gate	wS	5	0	0	1
Canisbay Twp					
- Lake of Two Rivers	wS	5	44	L-M	0
- New Lake Camp Ground	bF	5	0	0	1
Clara Twp	wS	5	220	S	1
Clyde Twp	bF	5	0	0	8
	bS	5	0	0	0
Freswick Twp - Hogan Lake	bF	5	33	L-M	5
	bS	5	0	0	0
Head Twp	wS	5	0	0	0
Hunter Twp	bF	5	95	M-S	0
Nightingale Twp - Rock Lake	wS	5	114	M-S	0
Preston Twp	wS	5	9	L	1
Stratton Twp - Achray (Plot C)	wS	2	15	L-M	1
White Twp					
- N of Petawawa River	bF	5	114	M-S	5
	bS	5	0	0	0
Wilkes Twp	bF	74	417	S	1
Aylmer District (3 locations)					
McGillivray Twp					
- Conservation Area	wS	4	28	L-M	0
West Oxford Twp					
- Con III - P.U.C.	bF	2	0	0	3
West Oxford Twp - P.U.C.	wS	28	53	L-M	3
Bancroft District (6 locations)					
Cardiff Twp	wS	5	0	0	1
Chandos Twp	bF	5	0	0	0
Harcourt Twp	bS	5	0	0	0
Limerick Twp	bF	5	20	L-M	0
Mayo Twp	wS	5	35	L-M	1
Wicklow Twp	wS	5	0	0	0

cont'd.

Table 4. Southern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Bracebridge District (4 locations)					
*Armour Twp - Pickerel Lake	wS	47	679	S	2
Bethune Twp	bF	50	44	L-M	1
*Oakley Twp - Clear Lake	bF	5	0	0	2
*Sinclair Twp - Bella Lake	bF	4	18	L-M	0
Brockville District (1 location)					
*Oxford on Rideau Twp - OMNR Tree Nursery, Kemptville	wS	0	9	L	0
Carleton Place District (6 locations)					
Fitzroy Twp	wS	1	174	M-S	1
Huntley Twp	wS	0	40	L-M	1
Lavant Twp - Robertson Lake	wS	0	0	0	1
Marlborough Twp	wS	2	64	M	1
Pakenham Twp	wS	1	100	M-S	1
Ramsay Twp	wS	0	106	M-S	1
Cornwall District (3 locations)					
Larose Forest					
- *Cambridge Twp - Lot 8 Con IV	wS	0	19	L-M	0
- *Cambridge Twp - Lot 26 Con V	wS	1	151	M-S	1
- *Clarence Twp - Lot 25 Con IX	wS	1	116	M-S	1

cont'd.

Table 4. Southern Ontario - Spruce budworm: summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Huronia District (6 locations)					
*Tosorontio Twp					
- Glencairn Seed Orchard	wS	1	85	M-S	0
	bS	1	0	0	0
*Vespra Twp					
- F-tract Seed Orchard	wS	1	37	L-M	0
- OMNR Tree Nursery Windbreak, Midhurst	wS	2	94	M-S	2
- OMNR Tree Nursery Windbreak, Midhurst	nS	1	0	0	2
- OMNR Tree Nursery Windbreaks, Midhurst	b1S	1	48	L-M	2
Lindsay District (4 locations)					
*Bexley Twp					
- Balsam Lake Prov. Pk	wS	5	21	L-M	2
Cartwright Twp	wS	5	12	L	0
*Clarke Twp					
- Orono hedgerow	wS	5	53	L-M	0
Verulam Twp	bF	4	18	L-M	1
Maple District (1 location)					
Uxbridge Twp	wS	6	104	M-S	3
Minden District (5 locations)					
Carden Twp	wS	9	26	L-M	1
Galway Twp	wS	2	0	0	2
Hindon Twp	bF	5	13	L	2
Minden Twp	bF	1	0	0	1
Somerville Twp	bF	5	19	L-M	3

cont'd.

Table 4. Southern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Owen Sound District (5 locations)					
Amabel Twp - Sauble Falls	wS	8	73	M	2
*Artemesia Twp	wS	1	0	0	0
Glenelg Twp	wS	4	15	L-M	3
Lindsay Twp	wS	3	78	M-S	1
St. Edmunds Twp - Crane River	wS	25	0	0	5
Parry Sound District (16 locations)					
Burton Twp	bF	0	0	0	2
Christie Twp	bF	13	13	L	4
McConkey Twp	bF	6	10	L	1
McKenzie Twp	bF	0	8	L	0
McMurrich Twp	bF	8	31	L-M	0
*Mowat Twp - Grundy Prov. Pk					
- Gate	wS	32	77	M-S	2
- Hwy 69	wS	50	161	M-S	2
- Swan Lake	wS	32	216	S	3
*Spence Twp					
- Plot 3[c]	bF	0	0	0	2
	wS	2	0	0	2
- Plot 11[d]	bF	5	0	0	1
	wS	5	28	L-M	1
- Plot 13 Check	bF	3	0	0	1
	wS	5	18	L-M	1
- Plot 14 Check	bF	1	0	0	3
	wS	0	40	L-M	3
Pembroke District (17 locations)					
Admaston Twp	wS	5	14	L	0
Alice Twp	bF	5	72	M-S	0
Bagot Twp	wS	5	12	L	0
Bromley Twp	wS	5	71	M-S	0

cont'd.

Table 4. Southern Ontario - Spruce budworm: summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Pembroke District (17 locations) (cont'd.)					
Brougham Twp	wS	5	0	0	0
Brudenell Twp	bF	5	15	L-M	1
Buchanan Twp (PNFI) - Orange Rd.	wS	8	41	L-M	5
Grattan Twp	wS	5	19	L-M	1
Griffith Twp	wS	5	32	L-M	5
Richards Twp - Round Lake	bF	5	84	M-S	0
Rolph Twp	bF	5	0	0	0
Ross Twp	wS	5	27	L-M	1
Sherwood Twp - west of Barry's Bay	wS	5	54	L-M	0
Stafford Twp - NPV, Rankin	bF	10	225	M-S	5
- NPV, Rankin	wS	27	583	S	5
Westmeath Twp	bF	5	0	0	0
Wilberforce Twp	wS	5	19	L-M	1
Simcoe District (2 locations)					
Charlotteville Twp - Turkey Point	wS	11	19	L-M	1
South Walsingham Twp - OMNR Tree Nursery	wS	13	30	L-M	2
Tweed District (4 locations)					
Clarendon Twp	wS	0	10	L	0
Denbigh Twp - Slate Falls Rd.	bF	0	12	L	0
*Effingham Twp	rS	0	12	L	0
Tudor Twp	wS	0	17	L-M	0

cont'd.

Table 4. Southern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (concl.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Wingham District (4 locations)					
Colborne Twp	wS	1	25	L-M	1
Downie Twp	wS	1	15	L	1
Ellice Twp - Ellice Swamp	wS	3	19	L-M	0
Minto Twp	wS	19	29	L-M	3

[a] S = severe, M = moderate, L = light, 0 = nil

[b]

Code	Categories
0	undamaged
1	light damage: <25% *total defoliation*, usually one season of severe defoliation.
2	moderate damage: 25% to 60% *total defoliation*, 2 or 3 seasons of severe defoliation.
3	severe damage: 60% to 80% *total defoliation*, 3 to 5 seasons of severe defoliation, will recover.
4	moribund or dying: 80% to 100% *total defoliation*, crowns grey in appearance, top dead or bare 50 cm to 150 cm.
5	less than 25% of *stand* dead.
6	25% to 50% of *stand* dead.
7	50% to 70% of *stand* dead.
8	more than 70% of *stand* dead.

[c] Aerially sprayed, *B.t.*, Dipel 88, 1981

[d] Aerially sprayed, *B.t.*, Thuricide 32B, 1981

* Samples requested by OMNR

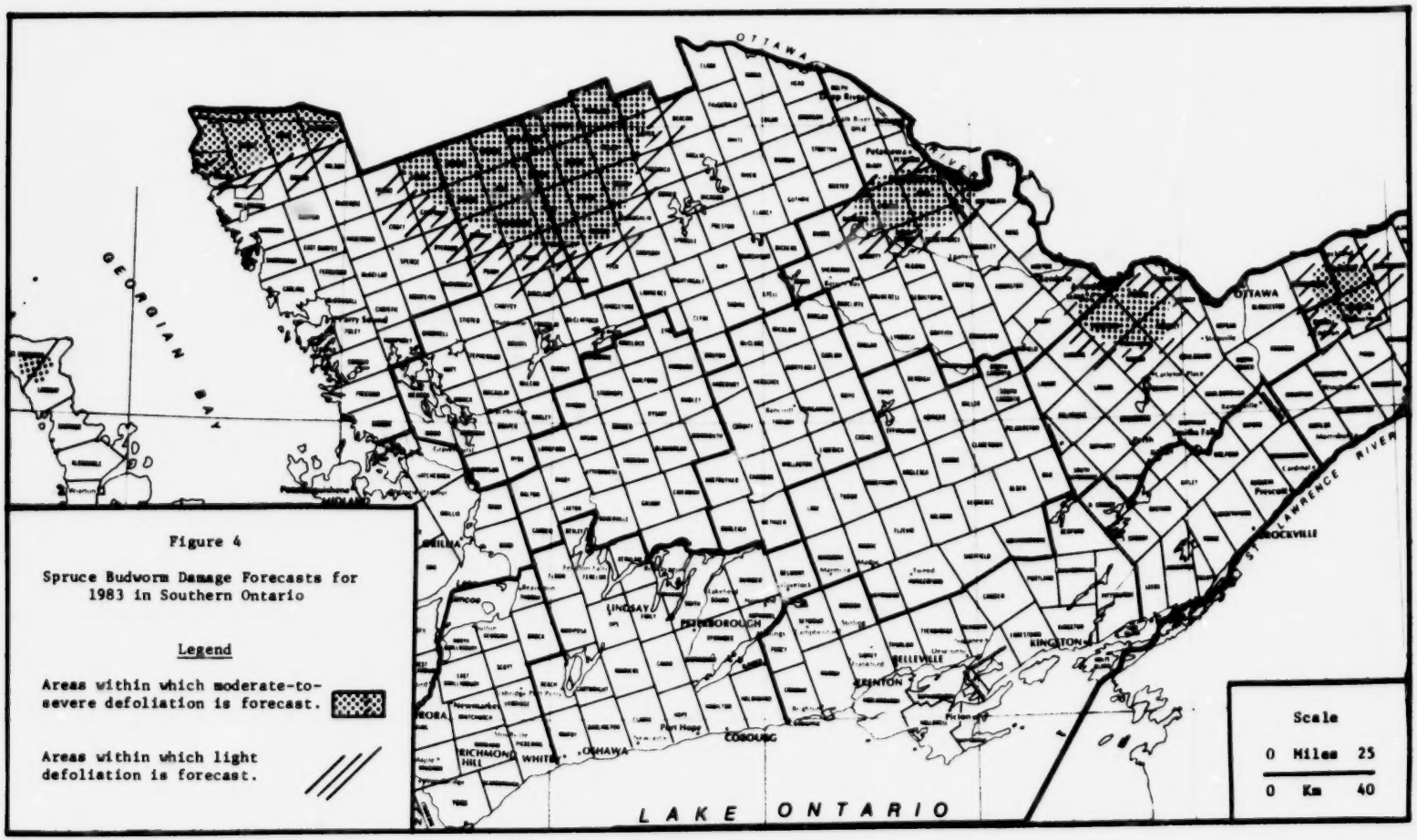


Figure 4

Spruce Budworm Damage Forecasts for 1983 in Southern Ontario

Legend

Areas within which moderate-to-severe defoliation is forecast.

Areas within which light defoliation is forecast.

Figure 5

Spruce Budworm-caused Mortality
in Southern Ontario, 1982

Legend

Areas within which balsam fir whole tree mortality and top mortality occur ● or ▨

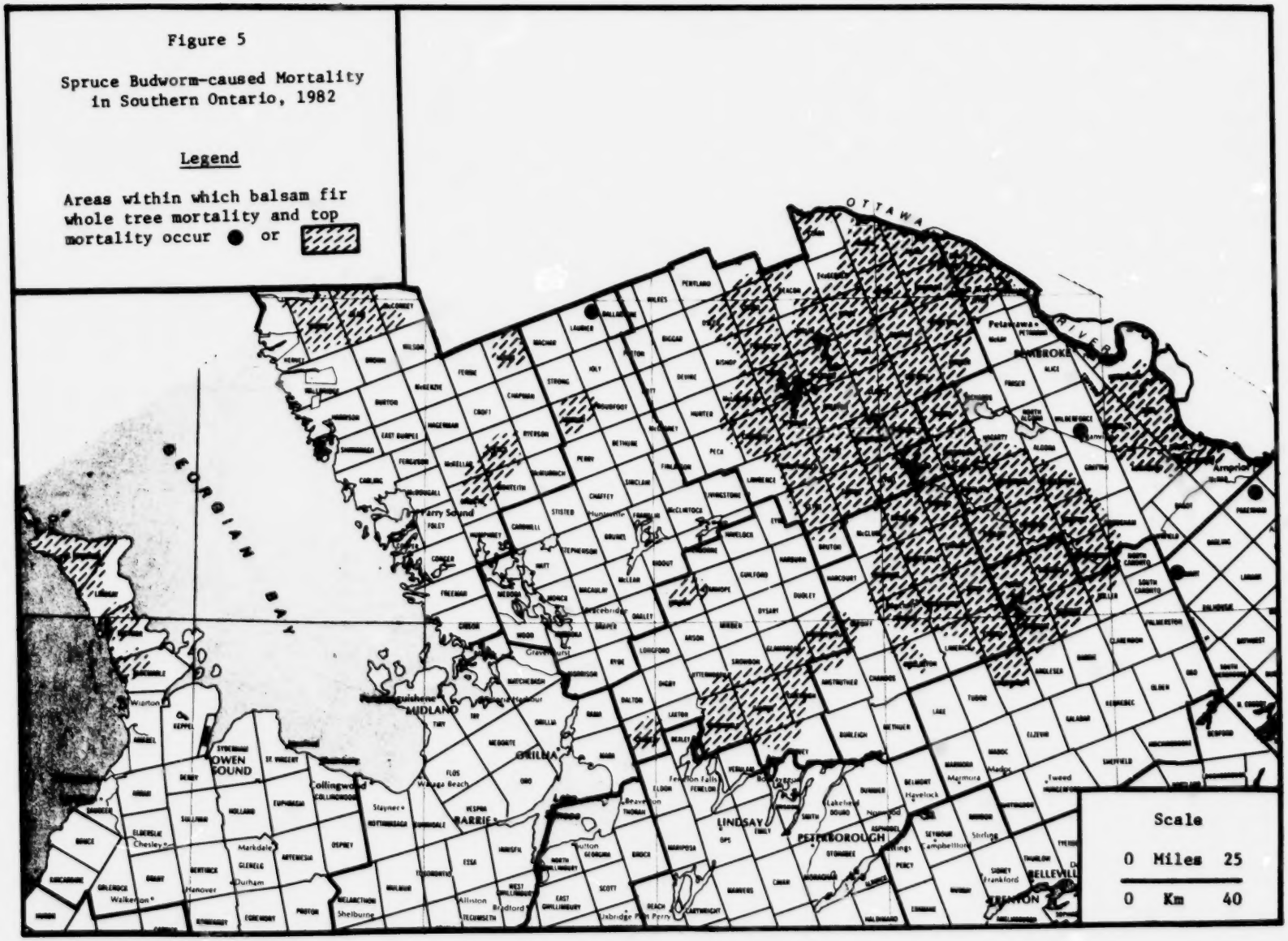


Table 5. Southern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years.

Location	Host	Tree mortality (%)								
		1974	1975	1976	1977	1978	1979	1980	1981	1982
Algonquin Park District										
Canisbay Twp										
- Wildlife Station	bF	25		32	41	44	49	96	96	
	wS							38	60	50
- Madawaska River	bF	55								
Clara Twp										
- E. of Deux Rivières	bF							60	48	54
Clyde Twp										
- Cauliflower Lake	bF				37	47	53	73	97	98
Deacon Twp - Brent Road	bF							50		
Nightingale Twp										
- Rock Lake	bF		49	33	39	47	45	84	42	36
	wS							28	10	6
Preston Twp										
- Annie Bay Dam	bF	38		41				95	98	
- Booth Lake	bF	52	71	78	84					
- Kitty Lake	bF	25	68							
- Shirley Lake	bF	24								
Sabine Twp										
- Hwy 127, Hay Lake Rd.	bF			49	61	65	65	78	84	83
Stratton Twp - Achray	bF	50		56						
	wS	57								
- Achray Plot A	bF				50					
	wS				13					
- Achray Plot B	bF				70					
	wS				36					
- Lone Creek	bF	80	92							
	wS	16	50							
Bancroft District										
Carlow Twp - New Carlow	bF	36								
Dungannon Twp	bF			34	41			44	55	55
	wS							8		
Faraday Twp	bF		24							
Herschel Twp	bF			21	29	26	29	49		
Mayo Twp	bF			14	21	27	34	100	90	
	wS							72	70	68
McClure Twp	bF	15		21						
Monteagle Twp	bF	39								

cont'd.

Table 5. Southern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (cont'd.)

Location	Host	Tree mortality (%)								
		1974	1975	1976	1977	1978	1979	1980	1981	1982
Bancroft District (cont'd.)										
Wicklow Twp	bF		45	49	63	66	69			
	wS						22			
- Papineau Creek	bF							66		
	wS							6		
- Ryan Road	bF							92	100	
	wS							44	82	
Bracebridge District										
Armour Twp	bF						32	80	92	92
	wS							18	22	10
Laurier Twp	bF							82	92	94
	wS							8	10	8
Carleton Place District										
Pakenham Twp	wS				0	0	0	0	0	0
Minden District										
Carden Twp	bF						10	78	84	92
	wS						52	22	24	14
Cavendish Twp	bF	32		45	51	56	73	92		
	wS							70		
Galway Twp - Bass Lake	bF	47		68	79	83	84			
	wS						76			
- Crystal Lake	bF	10			45	53	89			
- Union Lake	bF								74	64
	wS								2	2
Harvey Twp	bF	15			51	63				
Hindon Twp - Anson Creek	bF							44	60	48
	wS							16	18	10
Monmouth Twp	bF			60	63	74				
	wS					38				
Somerville Twp										
- Victoria Co. Forest	bF	31		37	48	60	78	84	92	88
	wS						64	76	86	82

cont'd.

Table 5. Southern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (cont'd.)

Location	Host	Tree mortality (%)								
		1974	1975	1976	1977	1978	1979	1980	1981	1982
Owen Sound District										
St. Edmunds Twp										
- Eagle Hbr. Rd	bF						62	76	86	92
	wS						0	0	0	0
- Johnston's Hbr. Rd	bF						96			
Parry Sound District										
Blair Twp	bF				4	11	51			
Christie Twp	bF								84	96
	wS								22	14
Lount Twp	bF								96	98
	wS								26	38
Spence Twp										
- Lot 47 Range B	bF					16	62	78	88	82
	wS					0	6	20	22	12
- Lot 55 Range B	bF					8	44	76	88	80
	wS					0	4	14	28	12
Pembroke District										
Griffith Twp	bF	34	57		68			100	76	
	wS				39	43	44	76		41
Matawatchan Twp										
- Camel Chute	bF		38	43	52	57	68	78	80	91
	wS		10					12	16	
Sebastopol Twp	bF						16	47	60	62
Wylie Twp PNFI	bF		65					98	96	
	wS							32	22	42
Tweed District										
Abinger Twp - Hwy 21	bF			35	40	32	55			
- Lot 27 Con XI	bF			32	41	48	41			
	wS			0	0	0	0			
- Hwy 41 at Mackavoy Lk	bF							38	40	24
	wS							6	6	4

cont'd.

Table 5. Southern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (concl.)

Location	Host	Tree mortality (%)								
		1974	1975	1976	1977	1978	1979	1980	1981	1982
Tweed District (cont'd.)										
- Hwy 41 2 km N of Mackavoy Lk	bF							36	20	
	wS							6	4	
- MacKavoy Lk	bF									9
Ashby Twp	bF			6	8	5	5			
	bF						49	96	92	100
	wS							42	50	62
Denbigh Twp										
- Slate Falls Road	bF		18	24	34	38	43	15	12	13
- Hwy 41 near Dist. Bdy	bF		5		7	7	5	2	2	0
- Hwy 41 near Buckshot Lk. Rd	bF		4		6	8	10	7	7	8
- Ashby Lake Rd	bF							12	6	4
	wS							0	0	0
Effingham Twp	bF			8	8	11	10	11	18	
Wingham District										
Minto Twp										
- Lot 1, Con VII	wS							0	0	0

Northeastern Ontario

Situation in 1982: This year the most significant changes in the spruce budworm situation occurred in the Northern and Northeastern regions (Fig. 6). In these two regions in 1982, the total area of moderate-to-severe defoliation was 6.067 million ha, a decline of 10.891 million ha from the 16.958 million ha of a year ago. Populations declined throughout a large area in the central part of the outbreak, stretching from Agawa Bay on Lake Superior to the Quebec border, including the southern portion of Wawa, Hearst, Kapuskasing and Cochrane districts, all of Chapleau, Timmins, Gogama and Kirkland Lake districts and the northern parts of Sault Ste. Marie, Blind River and Temagami districts. Low budworm populations were present on balsam fir and white spruce trees within this area, which totals approximately 10 million ha, and current defoliation was trace or light. Most of this area is in the same part of the province in which cold damage caused varying degrees of larval mortality in early June, 1980 and in which budworm defoliation was extremely variable in 1981. This development effectively split the area of moderate-to-severe damage into two large portions and a number of smaller pockets. In the southern area which includes the southern parts of the Sault Ste. Marie, Blind River, Gogama and Temagami districts and virtually all of the Sudbury, Espanola and North Bay districts, damage remained moderate to severe over about 3.905 million ha, and there was little change in infestation boundaries. The northern area includes most of Wawa District and smaller areas in southwestern Hearst District totalling some 1.551 million ha. Several other sizeable blocks of medium-to-heavy infestation persist as follows: 33,099 ha in Frost, Arnott and McEwing townships, and 134,151 ha in the area between McMillan and Richie townships in Hearst District, 115,519 ha east and west of Little Abitibi Lake in Cochrane District and 150,176 ha around the west end of Lake Abitibi adjacent to the Quebec border in the Cochrane and Kirkland Lake districts. In addition, approximately 60 smaller pockets of medium-to-heavy infestation totalling about 176,400 ha are scattered throughout the Hearst, Kapuskasing, Cochrane, Chapleau and Kirkland Lake districts.

Infestation Forecasts for 1983: In 1982, a total of 309 locations were sampled for egg masses in northeastern Ontario (Table 6). On the basis of a comparison of egg-mass counts from 224 locations sampled in 1981 and 1982, there was an overall decrease of 4% in northeastern Ontario this year. Egg-mass counts increased in four districts--Sudbury (34%), Hearst (24%), Sault Ste. Marie (17%) and Cochrane (4%)--but they were countered by decreases ranging between 7% and 89% in the rest of the districts. The largest decreases occurred in Timmins (89%), Kapuskasing (52%) and Chapleau (35%). The average number of egg masses per 9.29 m^2 of foliage was 215, with the highest average count occurring in Hearst District (418) and the lowest in Timmins (6).

Forecasts call for moderate-to-severe defoliation to continue throughout much of Wawa and southwestern Hearst districts. Another major area of defoliation totalling some 3.5 million ha should recur from Sault Ste. Marie to North Bay (Fig. 7). A number of smaller pockets of defoliation should occur elsewhere throughout

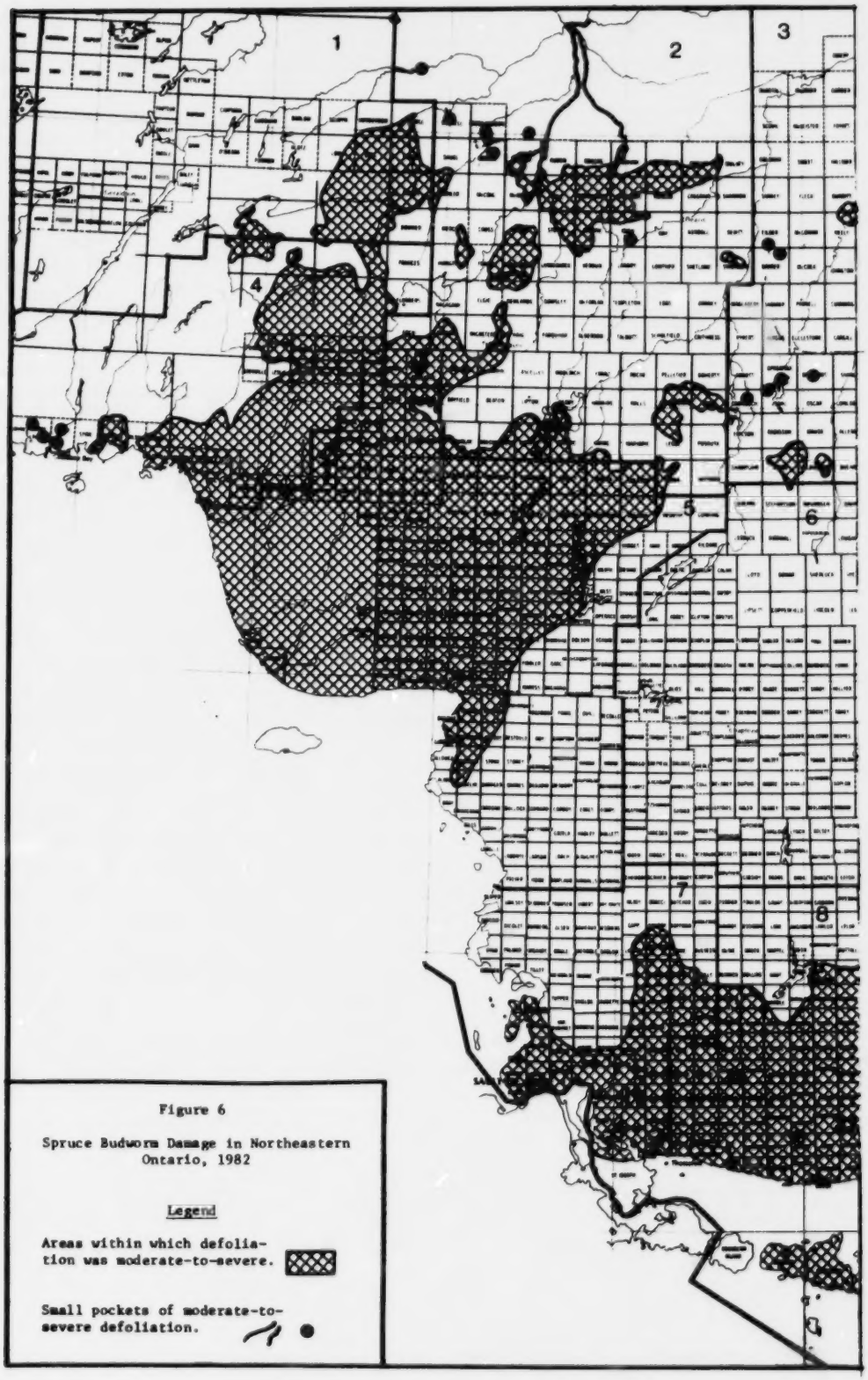


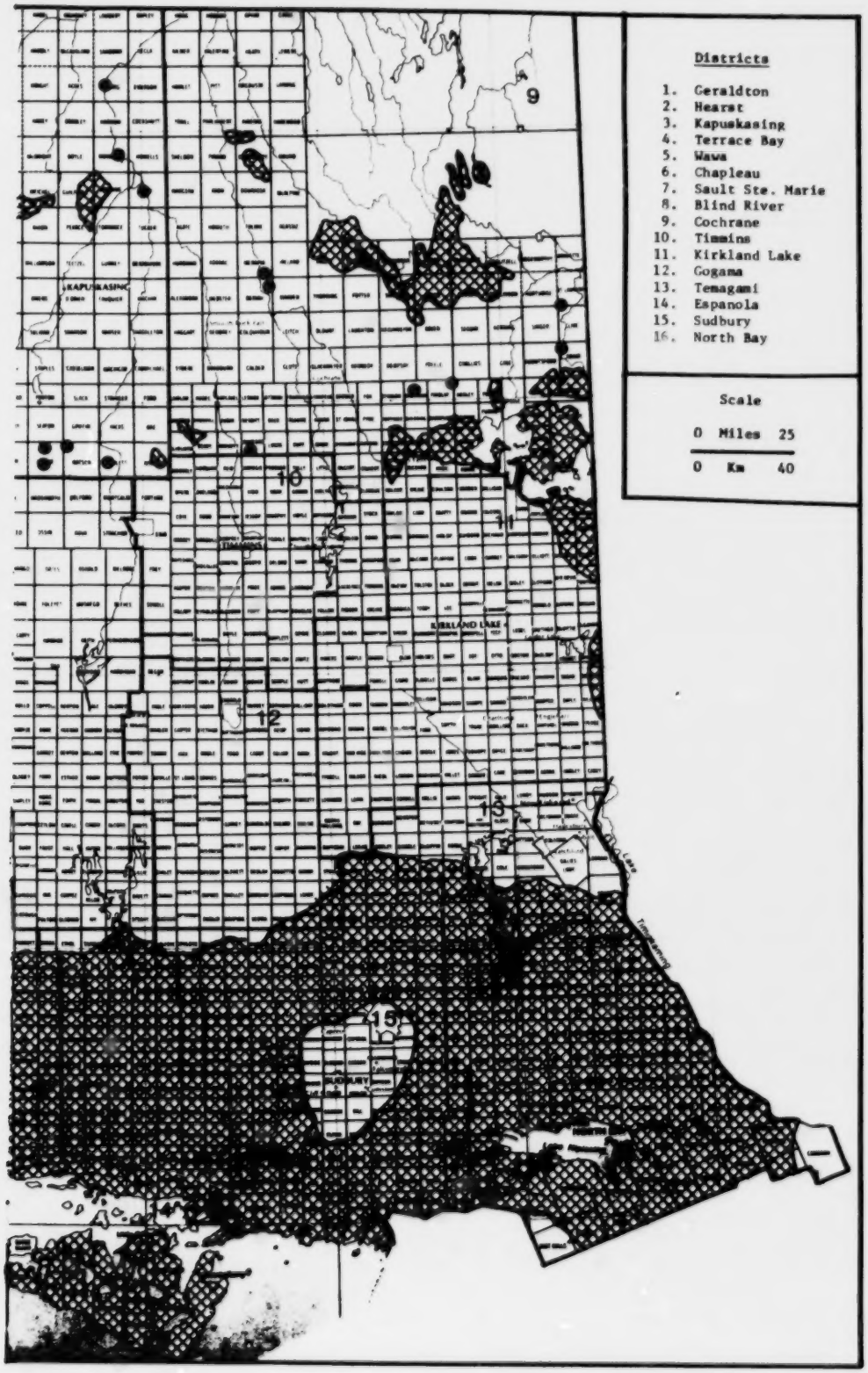
Figure 6

Spruce Budworm Damage in Northeastern Ontario, 1982

Legend

Areas within which defoliation was moderate-to-severe.

Small pockets of moderate-to-severe defoliation.


Districts
1. Geraldton
2. Hearst
3. Kapuskasing
4. Terrace Bay
5. Wawa
6. Chapleau
7. Sault Ste. Marie
8. Blind River
9. Cochrane
10. Timmins
11. Kirkland Lake
12. Gogama
13. Temagami
14. Espanola
15. Sudbury
16. North Bay
Scale
0 Miles 25
0 Km 40
KAPUSKASING
TIMMINS
KIRKLAND LAKE
SUDBURY

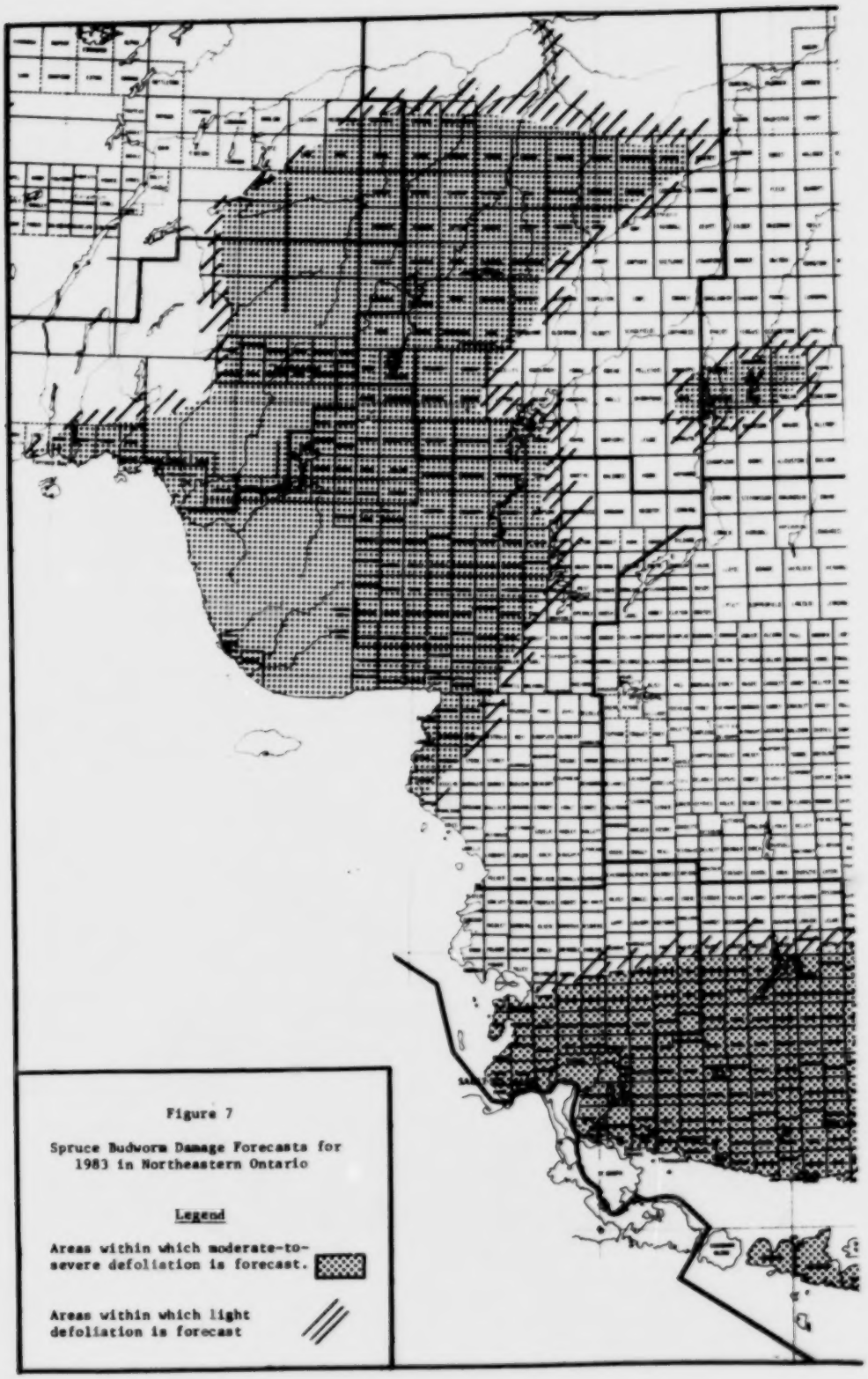

Legend
Areas within which moderate-to-severe defoliation is forecast.
Areas within which light defoliation is forecast

Figure 7

Spruce Budworm Damage Forecasts for 1983 in Northeastern Ontario

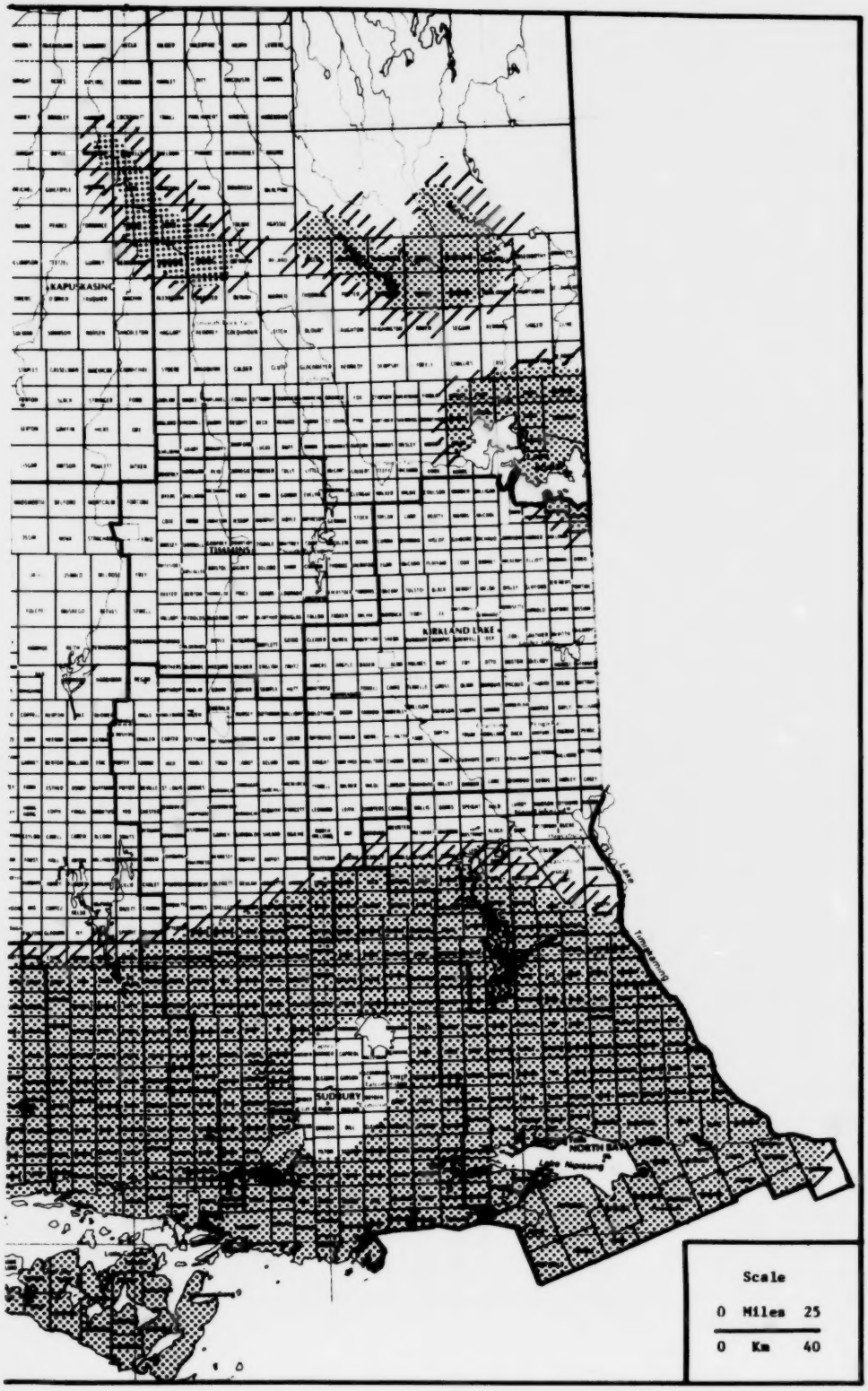

KAPUSKASING
TIMMINS
KIRKLAND LAKE
SUDBURY
NORTH BAY
Scale
0 Miles 25
0 Km 40

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983.

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Blind River District (18 locations)					
*Bridgland Twp	wS	11	8	L	1
- Area 2	wS	0	0	0	0
Bright Twp	bF	42	118	M-S	6
Dagle Twp	bF	12	0	0	5
Esten Twp	wS	17	125	M-S	2
Galbraith Twp	bF	22	94	M-S	2
*Kirkwood Twp	wS	7	106	M-S	2
- OMNR Tree Nursery	wS	11	96	M-S	1
Nicholas Twp	wS	2	21	L-M	2
*Parkinson Twp	wS	25	68	M	3
*Patton Twp	wS	2	204	M-S	0
Raimbault Twp					
- Mississagi Prov. Pk	bF	4	12	L	5
*Rose Twp - Plantation	wS	0	71	M-S	0
*Tweedle Twp	wS	0	41	L-M	0
*Vance Twp	wS	0	49	L-M	0
*Villeneuve Twp	wS	8	38	L-M	7
*Wells Twp	wS	50	192	M-S	3
*Yaremko Twp	wS	1	20	L-M	0
Chapleau District (22 locations)					
Barclay Twp					
- Missinaibi Prov. Pk	bF	8	15	L-M	5
Birch Twp - Horton Lake	bF	2	10	L	5
	bS	0	0	0	0
Borden Twp	bF	5	15	L-M	8
Carew Twp	bF	2	11	L	1
*Chapleau Twp					
- OMNR Tree Nursery	bF	2	35	L-M	1
Genoa Twp - Rush Lake	bF	20	59	M	6
Horwood Twp - Horwood Lake	bF	2	117	M-S	3
*Ivanhoe Twp					
- Ivanhoe Prov. Pk	bF	5	38	L-M	8
*Kirkwall Twp					
- Dunrankin Lake	bF	5	0	0	6
Lincoln Twp - Lincoln Lake	bF	2	31	L-M	5

cont'd.

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Chapleau District (cont'd.)					
Moen Twp	bF	2	0	0	3
Montcalm Twp - Elf Lake	bF	0	0	0	6
*Neelands Twp					
- Wakami Prov. Pk	bF	2	53	L-M	6
Ossin Twp - Komak Lake	bF	2	0	0	5
*Peters Twp					
- Shoals Prov. Pk	bF	2	28	L-M	6
	bS	0	17	L-M	0
Raney Twp - Denyes Lake	bF	2	0	0	2
*Reaney Twp					
- Five Mile Prov. Pk	bF	2	0	0	6
*Reeves Twp - OMNR SPA[c,d]	wS	5	38	L-M	2
- Check Plot (8.7 km east)	wS	5	15	L-M	3
Sandy Twp	bF	2	14	L	4
Cochrane District (25 locations)					
Adanac Twp - km 37	bF	5	92	M-S	2
+Aurora Twp - Stand 8	bF	1	12	L	2
Blakelock Twp - Mikiwan Lake	bF	85	756	S	4
	bS	3	528	S	2
Bonis Twp	bF	8	135	M-S	5
*Bragg Twp	bS	1	45	L-M	1
*Clute Twp - OMNR SPA[c] #3201	wS	1	94	M-S	2
- OMNR SPA[c] #3202	wS	1	48	L-M	2
*Colquhoun Twp					
- Greenwater Prov. Pk	wS	1	23	L-M	1
- Greenwater Prov. Pk (Check Plot)	wS	0	0	0	1
*Fournier Twp					
- OMNR SPA[c]	wS	1	0	0	1
Kesagami Lake	bF	1	28	L-M	1
Lake Abitibi					
- NE of Rabbit Creek	bF	25	621	S	5
- Iroquois Pt.	bF	1	43	L-M	5
Moody Twp - Bingle Area	bF	1	49	L-M	5
Nesbitt Twp	bF	0	12	L	2
Natogami Lake	bF	47	377	S	3

cont'd.

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Cochrane District (cont'd.) (25 locations)					
+Ottaway Twp - Stand 38	wS	1	27	L-M	2
*Ottaway Twp - OMNR SPA[c]	bS	0	0	0	1
Pinard Twp - Abitibi Canyon	bF	1	27	L-M	1
+Reaume Twp - Stand 128	bF	1	16	L-M	3
Sargeant Twp	bF	5	258	S	3
+St. John Twp - Stand 177	bF	1	28	L-M	2
*Swartman Twp - Pierre Lake	bF	1	67	M	3
Teefy Twp	bF	1	11	L	1
Espanola District (9 locations)					
Allan Twp	wS	18	140	M-S	1
Boon Twp	wS	22	114	M-S	1
Burpee Twp	bF	14	212	S	5
Dawson Twp	wS	10	332	S	0
Foster Twp	wS	2	21	L-M	0
*Nairn Twp - OMNR SPA[c]	wS	68	987	S	2
Oshell Twp	bF	4	19	L-M	5
Robinson Twp - Deer Yard	bF	15	96	M-S	6
Tehkummah Twp	bF	30	200	M-S	1
Gogama District (8 locations)					
Asquith Twp	bF	2	22	L-M	6
*Carter Twp - OMNR SPA[c]	wS	10	57	M	3
Dublin Twp	bF	15	238	S	5
	bS	0	150	M-S	0
Garvey Twp - Westree	bF	2	0	0	2
Halliday Twp - Relic Lake	bF	5	86	M-S	8
Invergarry Twp - OMNR SPA[c]	wS	[illegible]	0	0	3
Kelvin Twp	bF	5	16	L-M	5
Hearst District (88 locations)					
*Arnott Twp - .8 km S of East Arnott Rd	wS	92	431	S	4

cont'd.

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Hearst District (88 locations) (cont'd.)					
- 1.6 km N of West Arnott Rd	wS	42	102	M-S	3
	bS	4	334	S	1
- OMNR SPA[c,e]	wS	14	268	S	1
- OMNR Seed Tree Area E side of Twp	wS	22	288	S	2
- OMNR Seed Tree Area W side of Twp	wS	13	206	M-S	2
- Check Plot	wS	50	426	S	3
*Chelsea Twp - Spray Plot 1[f]	bF	80	513	S	3
	wS	45	675	S	3
- Spray Plot 4[f]	bF	46	499	S	3
	wS	33	797	S	3
- Newton Creek Check Plot	bF	48	599	S	3
	wS	66	613	S	3
+Cholette Twp - Stand 313	bF	92	159	M-S	3
+Drew Twp - Stand 192	bF	95	219	M-S	4
	wS	98	504	S	4
*Eilber Twp - Plantation	bS	1	0	0	1
+Ermine Twp - Stand 304	bF	3	80	M-S	3
	wS	36	64	M	3
Farquhar Twp	bF	21	184	M-S	2
	wS	27	313	S	2
+Foch Twp - Stand 438	bF	63	282	S	3
	wS	59	718	S	3
*Frost Twp - 4.8 km N of Nagagamisis River Bridge	bF	58	465	S	4
	wS	53	380	S	4
- Nagagamisis Prov. Pk Campground[g]	bF	6	108	M-S	3
	wS	15	75	M-S	2
*Fushimi Twp					
- Fushimi Prov. Pk, Campground[g]	bF	20	234	S	3
- Fushimi Prov. Pk, Check Plot	bF	49	316	S	3
Gourlay Twp - Gourlay Lake	bF	4	317	S	1
	wS	9	368	S	1

cont'd.

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Hearst District (88 locations) (cont'd.)					
*Hanlan Twp - OMNR SPA[c,e]	wS	2	341	S	1
- Check Plot	wS	4	322	S	1
Kabinakagami River	wS	71	428	S	3
Kohler Twp	bF	16	142	M-S	2
++Langemarck Twp - Shekak River	bF	1	108	M-S	3
*Larkin Twp - Larkin Plantation	wS	1	31	L-M	1
- OMNR Seed Tree Area E of Hwy 631	wS	33	797	S	3
- OMNR Seed Tree Area W of Hwy 631	wS	53	484	S	3
+Lizar Twp - Stand 316	bF	5	84	M-S	2
	wS	15	192	M-S	2
*McEwing Twp Spray Area					
- Block A[g]	wS	30	221	S	2
- Block B, North[g]	bF	8	58	M-S	2
	wS	28	244	S	2
- Block B, South[h]	bF	29	177	M-S	2
	wS	27	245	S	2
- Block C, Shrew Lake[g]	bF	12	144	M-S	2
	wS	31	248	S	2
- Block C, South[g]	wS	18	419	S	2
- Check Plot 1	wS	53	356	S	3
- Check Plot 4	bF	90	629	S	3
	wS	66	367	S	3
- Nagagamisis Prov. Pk[g] (East Plot)	bF	18	371	S	2
	wS	42	422	S	2
(Centre Plot)	bF	6	164	M-S	2
	wS	40	516	S	2
*McEwing Twp					
- 8.8 km N of Nagagamisis River Bridge	wS	47	305	S	3
- 10.1 km N of Nagagamisis River Bridge	wS	38	182	M-S	3
- Nagagamisis Prov. Pk (W of McEwing Creek)	wS	36	1843	S	2

cont'd.

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Hearst District (88 locations) (cont'd.)					
McMillan Twp - Check Plot	bS	1	30	L-M	1
Minnipuka Twp - Goat Lake	wS	3	34	L-M	8
	bS	1	0	0	7
Mulvey Twp	bF	1	15	L-M	3
Nagagami Twp - Nagagami Lake	bF	19	306	S	2
	wS	12	290	S	2
++Nassau Twp - Florin Lake	bF	43	370	S	3
++Nassau Twp - Road East	bF	95	215	M-S	3
	bS	10	208	M-S	1
Orkney Twp	bF	22	11	L	2
	wS	5	11	L	2
Ritchie Twp	bF	57	503	S	3
*Rogers Twp					
- Plantation 31[d]	bF	64	645	S	2
	wS	19	2261	S	2
- Plantation 43 (North)[f]	bF	6	269	S	1
	wS	3	264	S	1
- Plantation 43 (South)[f]	bF	2	442	S	1
	wS	1	294	S	1
- Plantation 49	bF	19	1012	S	2
	wS	6	890	S	2
- Check Plot	bF	68	281	S	2
	wS	14	2028	S	2
Staunton Twp	bF	15	232	M-S	3
*Stoddart Twp	bS	1	37	L-M	1
*Studholme Twp					
- Abram Lake (Residual mature)	wS	68	353	S	3
- Abram Lake (Plantation) 24 (63)	wS	1	73	M-S	1
Templeton Twp	bF	7	19	L-M	2
+Wicksteed Twp - Stand 75	bF	81	653	S	5
	wS	74	662	S	5
Kapuskasing District (27 locations)					
Cromlech Twp - Brunswick Lake	wS	2	9	L	5
Cumming Twp	bF	2	101	M-S	3
	bS	1	136	M-S	2

cont'd.

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Kapuskasing District (27 locations) (Cont'd.)					
*Fauquier Twp (Bonner Tree Improvement Centre)					
- Picnic Area (Check Plot)	wS	6	46	L-M	2
- Snow Machine Trail (Check Plot)	bS	2	28	L-M	1
- Compartment 16A[1]	wS	4	23	L-M	1
- Compartment 16E[1]	bS	2	0	0	1
- Compartment 19C[1]	wS	3	0	0	1
- Compartment 21D[1]	bS	2	0	0	1
*Fauquier Twp					
- OMNR SPA[c,h]	wS	0	17	L-M	1
- Check Plot	wS	2	0	0	1
- Remi Lake Prov. Pk	bF	7	10	L	5
Fenton Twp					
- km 37, Chain-of-Lakes Rd	bF	2	31	L-M	3
Guilfoyle Twp	bF	68	308	S	4
Howells Twp	wS	9	48	L-M	2
*Idington Twp					
- Plantation 07 (65)[d]	wS	2	0	0	1
- Plantation 07 (65)[d]	bS	2	0	0	1
- Check Plot	wS	2	18	L-M	1
	bS	3	0	0	1
Kipling Twp - Kipling Dam	bF	24	318	S	2
Lisgar Twp					
- km 66 Chain-of-Lakes Rd	bF	1	10	L	6
Mons Twp - Mons Lake	wS	1	0	0	6
Owens Twp - OMNR SPA[c,h]	bS	2	17	L-M	1
- Check plot	bS	2	0	0	1
Opasatika Twp - Rufus Lake	bF	22	89	M-S	6
	wS	24	166	M-S	6
*Williamson Twp	bF	24	471	S	3
Kirkland Lake District (33 locations)					
Alma Twp	bF	0	0	0	4
Bowman Twp	bF	0	21	L-M	1

cont'd.

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Kirkland Lake District (33 locations) (Cont'd)					
*Burt Twp					
- OMNR Tree Nursery	wS	2	185	M-S	1
- OMNR SPA[c]	wS	1	215	M-S	2
- Check Plot	wS	2	63	M	3
Chown Twp	bF	2	36	L-M	4
*Elliott Twp Area					
- Elliott Twp, Plot 6	bF	0	11	L	2
	wS	0	0	0	2
- Plot 7	bF	0	0	0	2
	wS	0	10	L	2
- Plot 8	bF	0	0	0	2
	wS	0	31	L-M	2
- Plot 9	bF	0	28	L-M	2
	wS	0	30	L-M	2
- Plot 11	bF	0	0	0	2
	wS	0	92	M-S	2
- Garrison Twp (Check Plot 1)	bF	4	42	L-M	3
	wS	7	38	L-M	3
- Harker Twp (Check Plot)	bF	5	77	M-S	4
	wS	16	165	M-S	3
- Lamplugh Twp	bF	12	70	M-S	3
	wS	15	116	M-S	2
- Lamplugh Twp (Check Plot)	bF	17	245	S	4
	wS	27	594	S	3
Hearst Twp	bF	0	79	M-S	4
Katrine Twp	bF	1	183	M-S	4
Maisonville Twp	bF	1	113	M-S	4
	bS	0	0	0	1
Mulligan Twp	bF	1	18	L-M	3
Pacaud Twp	bF	4	254	S	4
	bS	2	262	S	1
Truax Twp	bF	13	67	M	4
Yarrow Twp	bF	0	0	0	4

cont'd.

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
North Bay District (12 locations)					
Bastedo Twp, Hwy 64	wS	16	491	S	1
*Cameron Twp	bF	19	263	S	0
*Gurd Twp	wS	17	435	S	1
*Jocko Twp	bF	27	300	S	6
*Latchford Twp - Plantation	wS	1	0	0	0
*Mattawan Twp	bF	35	195	M-S	2
*McNish Twp - Plantation	wS	1	0	0	0
Notman Twp	bF	24	79	M-S	4
*Patterson Twp - Restoule Prov. Pk	bF	2	6	L	1
Phelps Twp	bF	45	451	S	3
*Sisk Twp - Martin River Prov. Pk	bF	38	218	M-S	4
*South Himsworth Twp - Freeman Chute	wS	55	1819	S	5
Sault Ste. Marie District (9 locations)					
Butcher Twp	bF	0	80	M-S	7
Gapp Twp - Ragged Lake	wS	0	0	0	0
Haviland Twp	bF	40	218	S	1
Herrick Twp - Pancake Prov. Pk	bF	17	33	L-M	1
Jollineau Twp	bF	68	386	S	6
	bS	5	54	L-M	3
McIlveen Twp	wS	1	0	0	5
Tarbutt Additional Twp	bF	72	589	S	5
Vibert Twp - Wart Lake	bF	6	45	L-M	2
Sudbury District (8 locations)					
Antrim Twp - Halfway Lake Prov. Pk	wS	67	1344	S	3
Attlee Twp, Hwy 637	wS	36	482	S	2
Burwash Twp	wS	2	41	L-M	0
Dowling Twp	bF	3	84	M-S	0

cont'd.

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Sudbury District (8 locations) (cont'd.)					
Dunnett Twp	bF	24	137	M-S	2
Hawley Twp	wS	7	156	M-S	4
Parking Twp	wS	21	383	S	1
Trill Twp	wS	81	430	S	3
Temagami District (14 locations)					
Askin Twp	bF	8	304	S	4
	bS	4	442	S	1
Aston Twp	wS	0	67	M	1
Barr Twp	wS	1	224	M-S	7
Eldridge Twp	wS	33	88	M-S	3
Gillies Limit Twp	bF	0	122	M-S	2
Hartle Twp	wS	28	450	S	3
Olive Twp	bF	39	465	S	3
Riddell Twp	bF	35	120	M-S	4
*South Lorrain Twp					
- OMNR Friday Lake SPA[c,j]	wS	8	155	M-S	0
- Friday Lake Check Plot	wS	75	136	M-S	1
- OMNR Matabitchuan SPA[c,j]	wS	3	38	L-M	1
Strathy Twp	bF	18	434	S	4
Yates Twp	bF	57	1126	S	4
Timmins District (7 locations)					
Carnegie Twp	bF	0	0	0	1
Evelyn Twp	bF	0	29	L-M	2
Godfrey Twp	bF	0	0	0	1
Haggard Twp	bF	0	0	0	1
Keefer Twp	bF	0	16	L-M	2
McKeown Twp	bF	0	0	0	2
Robb Twp	bF	0	0	0	2

cont'd.

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Wawa District (29 locations)					
Abraham Twp	bF	7	326	S	0
Asselin Twp	bF	44	88	M-S	2
Bailloquet Twp					
- Black Trout Lake	bF	54	325	S	3
	bS	1	201	M-S	3
*Bryant Twp - OMNR SPA[c]	bS	4	155	M-S	1
Cudney Twp - Esnagi Lake	bF	63	445	S	6
Dahl Twp - Obatanga Prov. Pk	bF	16	321	S	3
Debassige Twp	wS	1	48	L-M	6
Dumas Twp	bS	0	64	M	0
Dunphy Twp	bF	7	81	M-S	3
Hydro Rd - Umbata Falls	bF	94	364	S	6
Huotari Twp	wS	2	94	M-S	1
Labelle Twp					
- Agawa Campground	bF	1	21	L-M	0
McCron Twp - Access Rd	bF	42	266	S	3
*Mikano Twp - Horsehead Lake	wS	52	2398	S	1
Noganosh Twp	wS	1	24	L-M	5
Peever Twp					
- Crescent Lake Campground	bF	0	0	0	0
Peterson Twp					
- Rabbit Blanket Campground	bF	81	143	M-S	3
Pukaskwa National Pk					
- Bonami Cove	wS	62	561	S	3
- Cascade River	bF	38	146	M-S	6
- Oiseau Bay - 11.2 km east	bF	94	530	S	4
- Oiseau Bay	bF	32	180	M-S	3
- Simons Harbour	bF	38	56	M	3
- Tip Top Mountain	bF	98	122	M-S	6
	bS	52	375	S	1

cont'd.

Table 6. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (concl.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Wawa District (29 locations) (cont'd.)					
Regan Rd - 9 km south	bF	50	282	S	3
Simpson Twp	wS	13	35	L-M	6
Strickland Twp	wS	28	346	S	1
*White Lake Prov. Pk	bF	44	1435	S	1

[a] S = severe, M = moderate, L = light, O = Nil

[b]

Code	Categories
0	undamaged
1	light damage: <25% *total defoliation*, usually one season of severe defoliation.
2	moderate damage: 25% to 60% *total defoliation*, 2 or 3 seasons of severe defoliation.
3	severe damage: 60% to 80% *total defoliation*, 3 to 5 seasons of severe defoliation, will recover.
4	moribund or dying: 80% to 100% *total defoliation*, crowns grey in appearance, top dead or bare 50 cm to 150 cm.
5	less than 25% of *stand dead*.
6	25% to 50% of *stand dead*.
7	50% to 70% of *stand dead*.
8	more than 70% of *stand dead*.

[c] SPA = Seed Production Area

[d] Aerially sprayed, Virus, 1981

[e] Aerially sprayed, Orthene followed by Matacil, 1982

[f] Aerially sprayed, Matacil, 1982, one application

[g] Aerially sprayed, *B.t.*, Dipel 88, 1982, one application

[h] Aerially sprayed, *B.t.*, Novabac 3-e, 1982, one application

[i] Ground sprayed, Orthene, 1982, two applications

[j] Aerially sprayed, Orthene, 1982, two applications.

*Samples requested by OMNR

++Samples requested by Domtar Forest Products

+Samples from Ontario Paper Co. Ltd. Limits

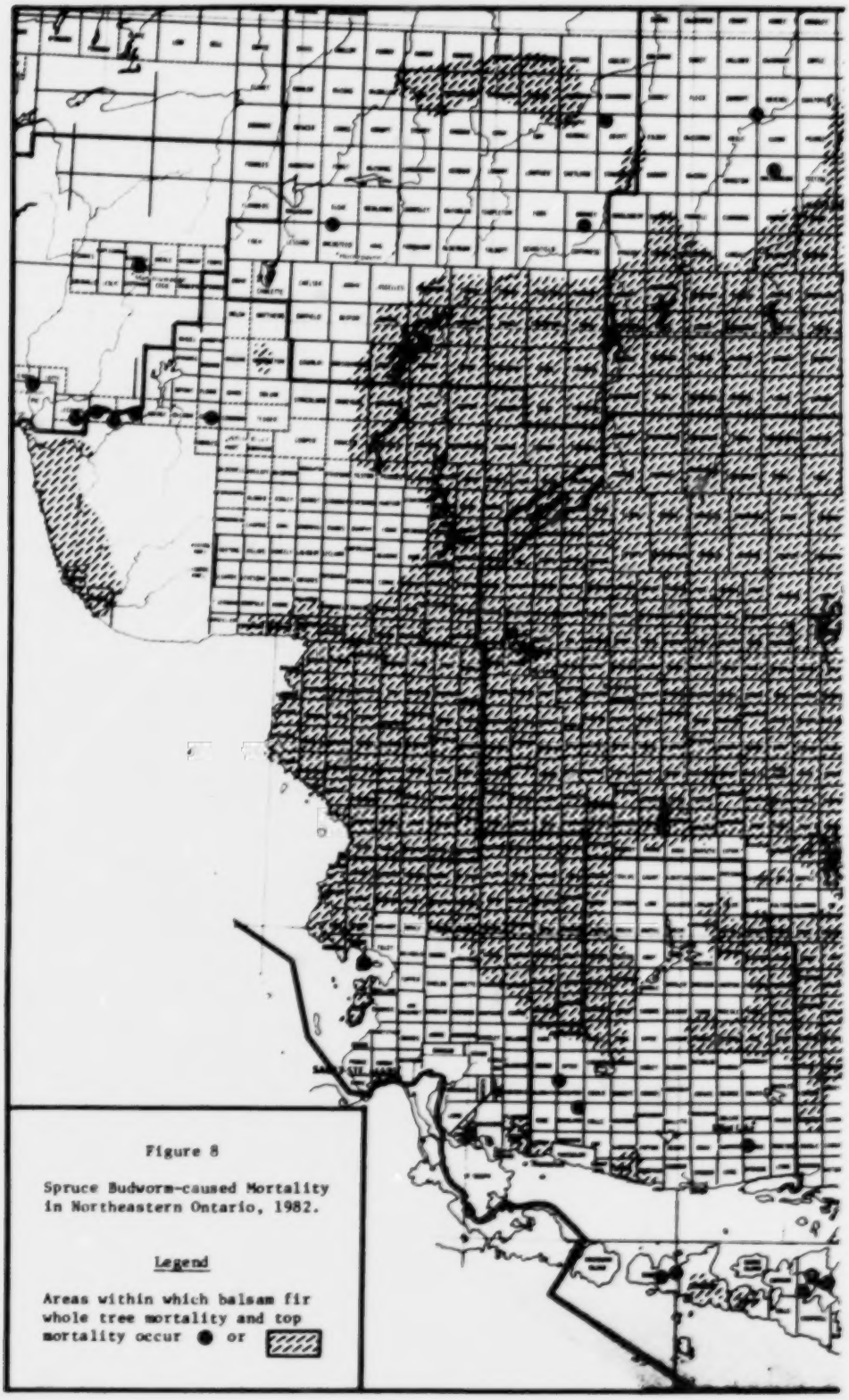
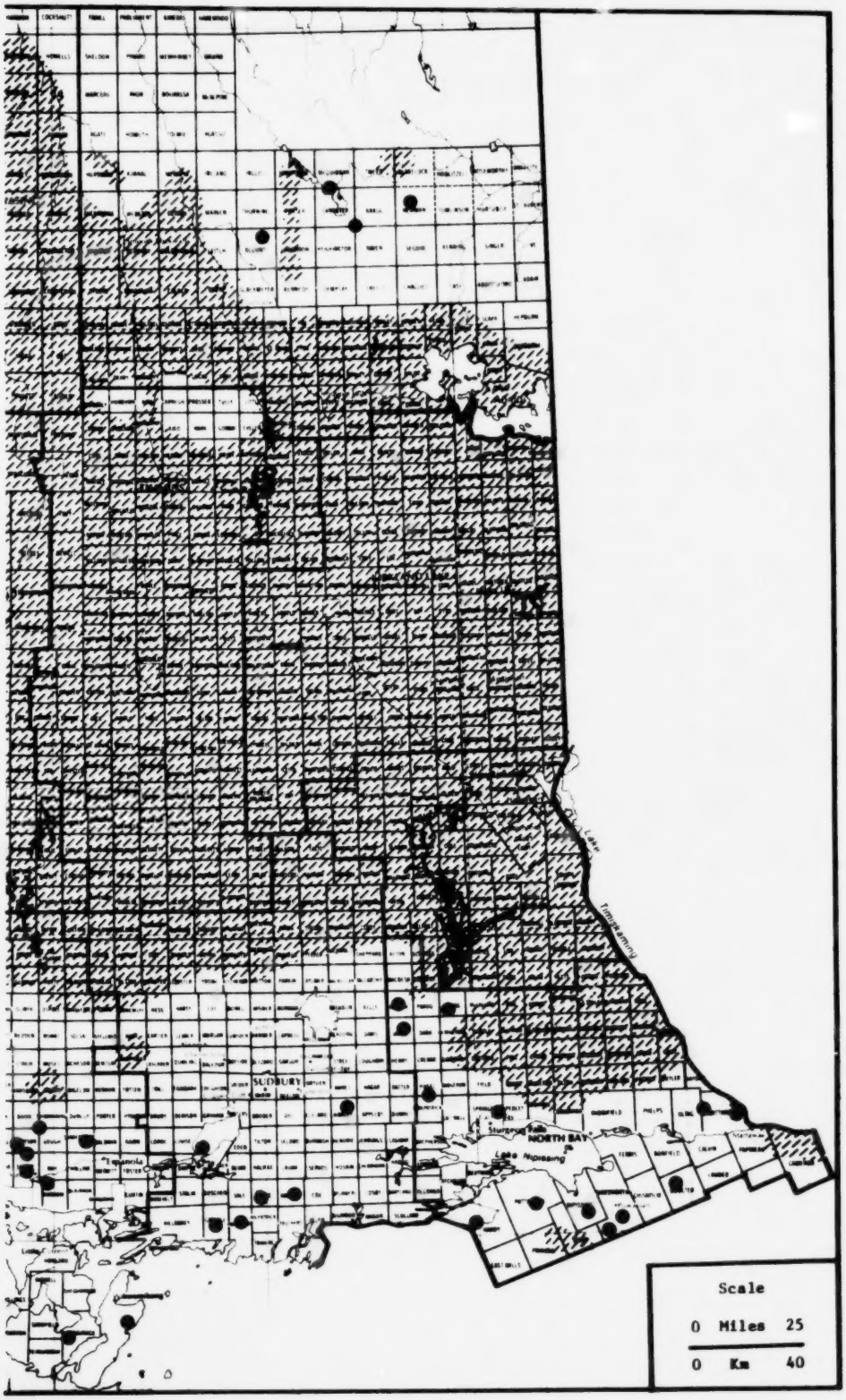


Figure 8

Spruce Budworm-caused Mortality in Northeastern Ontario, 1982.

Legend

Areas within which balsam fir whole tree mortality and top mortality occur ● or ▨


SUDBURY
NORTH BAY
Lake Nipissing
Scale
0 Miles 25
0 Km 40

the two regions, especially in Hearst, Cochrane and Kirkland Lake districts.

Tree Mortality: In northeastern Ontario the area of budworm-associated tree mortality increased in 1982 by approximately 362,000 ha to a total of 9.934 million ha (Fig. 8). New pockets of tree mortality were detected in Lefroy, Galbraith, Bridgland and Lawlor townships in Blind River District and in Sault Ste. Marie District there was a very slight expansion of the 1981 boundaries. This year the largest increases occurred in the three northern districts of Wawa, Hearst and Kapuskasing. In Wawa District most of the new areas of tree mortality were found along the Superior shore in Pukaskwa National Park from the White River in the north to Homer Township in the south. A smaller pocket of mortality was also mapped in Hambleton Township. In Hearst District, a new area of tree mortality encompassing some 10 townships was detected just north of Highway 11 between McMillan and Casgrain townships. New tree mortality also occurred in a small pocket just north of Hornepayne in Wicksteed Township. Another large area of budworm-associated tree mortality was mapped northeast of the town of Kapuskasing between the Kapuskasing and Groundhog rivers and north along the Mattagami River as far as Harmon Township. Several new pockets of mortality were reported in Hurdman, Blount and Tweed townships and in the Little Abitibi Lake area in Cochrane District.

A check of some 142 plots throughout northeastern Ontario revealed that balsam fir mortality had increased by an average of 10% in 1982 and white spruce about 4%, and that there was little change in most black spruce stands. A summary of spruce budworm-associated tree mortality in northeastern Ontario is presented in Table 7. Depletion by the spruce budworm, as a result of tree mortality, has been estimated at about 67.317 million m^3 for this part of the province. This total represents losses for each of the three major host species up to 1982.

North Central Ontario

Situation in 1982: Areas infested in north central Ontario, which, for the purposes of this report, includes the districts of Terrace Bay, Geraldton and Nipigon, are included in the totals quoted for budworm defoliation in northeastern and northwestern Ontario (Tables 1 and 2).

In 1982 there was an overall increase of about 51,000 ha in the area of moderate-to-severe defoliation in north central Ontario (Fig. 6 and 9). This is in spite of the fact that there was a decrease of some 46,000 ha in Geraldton District, primarily in Downer, Boyce and Bicknell townships. In Terrace Bay District, the area of defoliation expanded by some 71,000 ha with modest increases along the western edge of the main body of infestation and small pockets of new defoliation in the Caramat-Stevens area. In addition, the small pockets of moderate-to-severe defoliation along the north shore of Lake Superior between Priske and Walsh townships increased in size. In Nipigon District, an additional 21,000 ha of new defoliation were mapped as a result of expansion of the Poshkokagan Lake infestation which, until 1981, had been confined to Thunder Bay District.

Table 7. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years.

Location	Host	Tree mortality (%)							
		1975	1976	1977	1978	1979	1980	1981	1982
Blind River District									
McNie Twp	bF	4		49	66	94			
Nicholas Twp	bF					23	40	58	73
	wS					0	0	0	0
Renwick Twp	bF	26	68	77	85	97			
	bF	15	24	55	63	77	72	98	
	bF	2	47	56	43	70	87	97	
Sturgeon Twp	bF	1	6	10	29	56	81	83	95
	wS					0	2	4	30
Timbrell Twp	bF	16	55	61	88	91			
Villeneuve Twp	bF	3	10	11	34	69	84	94	
	wS					0	6	6	6
Chapleau District									
Abney Twp	bF					12		36	34
	wS					0		9	22
Birch Twp	bF			20	29	37	46	67	69
	wS				0	0	0	22	24
Bliss Twp	bF	14	30	51	55		61	64	62
	wS				0		0	0	0
Bonar Twp	bF		25		68				
Bordeleau Twp - Gale Lake	bF	64		70			90		
Borden Twp E of old CIP Rd	wS				9	17			
- 18.7 km E of Hwy 129	wS							42	70
- 19.8 km E of Hwy 129	bF	55	73	85	87	90			
	wS			12	18	22	32		
- Westover Lake	bF	19	20				72	83	79
Bounsall Twp	bF				41	68			
Brackin Twp	bF			61					
Brutus Twp	bF		13		19	72			
Buckland Twp - Addison Lake	bF		74						
Caouette Twp	bF	27	39		62		71	87	
Chewett Twp - Hwy 101	bF	10	15		37	69	72	89	84
- Cedric Lake Rd	bF	0		12		39			
Cochrane Twp - Kanipahow Rd	bF	28	32			62		87	91
	wS						6	18	56
- Hwy 101	bF	52		62					
Cosens Twp	bF	2	10		23		38	52	62

cont'd.

Table 7. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (cont'd.)

Location	Host	Tree mortality (%)							
		1975	1976	1977	1978	1979	1980	1981	1982
Chapleau District (cont'd.)									
Dalmas Twp	bF	32		72	83	84	90		84
	wS	2		28	28	29	30	38	44
Dupuis Twp	bF	56	71	75	78	93			
Evans Twp	bF			9					
Fingal Twp	bF					20			
Fitzsimmons Twp	bF	25							
	bF			44	83	95			
	wS			0	21	50			
Foleyet Twp - Hwy 101	bF	0		0			24	42	38
	wS						2	12	12
Gilliland Twp	bF	21	33		40	63	68	73	75
	wS				11	12	12	22	36
Green Twp	bF	8	10		15	37	58	76	78
Halsey Twp - Nemegos Rd	bF	42		58		69	91		
Heenan Twp	bF			8					
Hill Twp	bF	8				95			
Hoey Twp - Lawson Lake	bF	55	55	76	76	79	83		
	wS			14	14	26	28		
- Hwy 101	bF						38	92	
	wS						12	34	38
- Wildwood Camp	bF							42	64
	wS							16	38
Ivanhoe Twp - Ivanhoe Park	bF				30	54	69	86	88
	wS					23	29	46	50
Kelsey Twp - Wakami Park	bF				63		98		94
	wS						4		32
Kildare Twp	bF			43					
Kosny Twp	bF				68	87			
	wS				5	12			
Lemoine Twp	bF				41				
Lipsett Twp - Lafreniere Lumber Rd.	bF		30						
- Chapleau Lumber Rd.	bF		35						
Margaret Twp	bF				48	78	84	87	92
	wS						2	0	0
Marshall Twp	bF	23				93			
McNaught Twp	bF							68	68
	wS							8	26
Muskego Twp	bF				33		78	87	84
Nimitz Twp	bF						14	20	14
	wS						4	6	6
Pattinson Twp	bF	9		34		72	94		

cont'd.

Table 7. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (cont'd.)

Location	Host	Tree mortality (%)							
		1975	1976	1977	1978	1979	1980	1981	1982
Chapleau District (cont'd.)									
Reaney Twp	bF	10		22		35	58	89	
Reeves Twp, OMNR SPA	bF	22					43	90	
	wS								12
Sadler Twp	bF	21		42		87	93		
Sandy Twp	bF						69	72	71
	wS						14	22	36
Windego Twp	bF		66		68	78			
Cochrane District									
Abitibi Lake - north	bF					0	0	14	16
- south	bF					8	7	21	18
Aurora Twp	bF							62	83
Bonis Twp	bF					0	3	7	7
Haggart Twp	bF						0		
Moody Twp	bF					0	2	5	7
Mortimer Twp	bF							13	17
	wS							0	0
Nesbitt Twp	bF					0	0		
	wS						0		
Potter Twp	bF							3	9
Stimson Twp	bF						8	16	24
Sydere Twp	bF							4	3
	wS							0	0
Espanola District									
Allan Twp	bF						6	4	10
	wS						2	0	0
Gaiashk Twp	bF						11	23	25
Hallam Twp	bF						9		
Hotte Twp	bF			64	64	78			
Ouellette Twp	bF			60	95	96			
Robinson Twp	bF					32			
	bF					28			
- Burnt Island Rd	bF						69	80	80
- Wood Carrol Bay Rd	bF						42	61	67
Salter Twp	bF						15	16	26
Teasdale Twp	bF						12	18	23

cont'd.

Table 7. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (cont'd.)

Location	Host	Tree mortality (%)							
		1975	1976	1977	1978	1979	1980	1981	1982
Gogama District									
Asquith Twp	bF		39	86	88	94			
	bF				18	47	50	53	
Chester Twp	bF					12	16	29	43
Dublin Twp	bF					13	17	31	48
Fawcett Twp	bF				10		39	48	
Garibaldi Twp	bF				99				
	bF				31	43	49	52	47
Gouin Twp	bF					14	19		79
	wS								2
Hazen Twp	bF			36	38	58	69	81	92
	bS								4
Invergarry Twp	bF						16	20	
	wS						2	2	2
- Watershed	bF								2
Kelvin Twp	bF				6	23	38	42	71
Macmurchy Twp	bF			15	27	76	89		
Marshay Twp	bF	39							
Miramichi Twp	bF		70	100					
	bF				37				
Ogilvie Twp	bF			4	20				
Onaping Twp	bF	77							
Paudash Twp	bF					21	33	43	62
St. Louis Twp	bF				20	40	48		
Valin Twp - Welcome Lake	bF			75					
Hearst District									
Cholette Twp	bF				0	0		0	0
	wS						0	0	0
Franz Twp	bF					14	6	28	
	wS						0	0	
Hook Twp	bF				34				
Minnipuka Twp	bF				16				
	wS				4				
	bF				37	87	95	97	100
	wS				14	40			
	wS						7	9	7
Rogers Twp	bF							0	3
	wS							0	0

cont'd.

Table 7. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (cont'd.)

Location	Host	Tree mortality (%)							
		1975	1976	1977	1978	1979	1980	1981	1982
Hearst District (cont'd.)									
Shannon Twp	bF							3	2
Staunton Twp	bF					0	0	2	1
Kapuskasing District									
Abbott Twp - Brunswick Lake	bF				71	96			
	wS					22			
- Main Road	bF						94		100
	wS							14	17
Cromlech Twp	bF		14		0				
Cummings Twp	bF					2	0	4	
	wS						0	0	
Fauquier Twp	bF					2	7	4	7
Fenton Twp	bF					0	0	4	4
Guilfoyle Twp	bF								17
Gurney Twp	bF							3	5
Lisgar Twp	bF					4	21	47	68
Machin Twp - Groundhog River (Plantation)	bF								16
	wS							0	0
- Main Road	bF						2	27	25
	wS							0	0
Mons Twp	bF				61				
	wS				36				
Opasatika Twp - Opasatika Lake	bF		2		0	2			
- Rufus Lake	bF						6	39	52
Shanly Twp	bF					3	4	3	4
	wS							0	0
Slack Twp	bF						0	0	2
Stringer Twp - Groundhog R. Jct.	bF					0	0	4	7
	wS						0	6	4
- Ten Mile Rapids	bF							84	90
Torrance Twp	bF							0	
	wS							0	
Williamson Twp	bF							3	5
Kirkland Lake District									
Alma Twp	bF			46	78	86	96	98	
Charters Twp - Montreal R.	bF	14	44	53	64				
Chown Twp	bF		3	8	17	23	26	50	58
Doon Twp	bF			75	92				
Dufferin Twp - McKee Lake	bF			83	87				

cont'd.

Table 7. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (cont'd.)

Location	Host	Tree mortality (%)							
		1975	1976	1977	1978	1979	1980	1981	1982
Kirkland Lake District (cont'd.)									
Elliott Twp - Dickson Check	bF						4		
- Plots C & D (1981 plots 1 & 2)	bF						9	17	
- Plot F	bF						8		
- Plot G	bF						17		
- Plot 1 (1981 Plot 9)	bF						21	37	
- Plot 3	bF						0		
- Plot 4	bF						4		
- Plot 5 (1981 Plot 6)	bF						5	18	19
- Plot 6	bF						8		
- Plot 7 (1981 Plot 7)	bF						16	37	
- Plot 9	bF						16		
- Plot 10 (1981 Plot 10)	bF							42	
- Plot 11 (1981 Plot 8)	bF						16	16	16
- Plot 11	wS						0		
- Plot 12	bF						14		
- 1981 Plot 4	bF							23	
- 1981 Plot 5	bF							14	
- 1981 Plot 11	bF							38	
Garrison Twp	bF						24	52	65
	wS						1	1	2
- East Check	bF							28	
- West Check	bF							21	
Gauthier Twp	bF			13	17	35	58	77	90
Gross Twp	bF		7	10	24	45	93	100	
Harker Twp	bF						21	22	30
	bS						1	1	1
- Check Plot	bF							41	36
- Imperial Lake Check	bF							19	23
	bS							20	18
Hearst Twp	bF			4	25	71	97	100	
Hincks Twp	bF			53					
James Twp	bF			18	32	58	79	81	97
Lamplugh Twp - Check Plot	bF							4	6
McFadden Twp	bF			16	20	49	54	56	96
McNeil Twp	bF				11				
Milner Twp	bF	4							
Truax Twp	bF		36	46	87	87			
Van Hise Twp	bF		51	62	95	95			
Harrow Twp - Mistinikon Lake	bF		75						
Yarrow Twp	bF			70	91				

cont'd.

Table 7. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (cont'd.)

Location	Host	Tree mortality (%)							
		1975	1976	1977	1978	1979	1980	1981	1982
North Bay District									
Angus Twp	bF							74	82
Bastedo Twp	bF					2		10	16
	wS								2
Cameron Twp	bF					11		22	25
Clarkson Twp	bF						28	17	25
	wS						7	7	20
French Twp	bF						8	4	16
Jocko Twp	bF						23	28	29
	bS						10	10	8
Kirkpatrick Twp	bF						12	8	
	wS						0	0	
Lyman Twp	bF					9		36	33
Mattawan Twp	bF						54	31	
	wS						12	14	
McLaren Twp	bF					8		19	33
McNish Twp	bF						39	37	44
	bS						8	10	14
Nipissing Twp	bF						3	10	14
Pedley Twp	bF					8		9	18
Sisk Twp	bF					29		22	23
Thistle Twp	bF					40		55	55
Sault Ste. Marie District									
Bracci Twp									
- North Chubb Lake	bF	13		68		79		93	
Butcher Twp - Goulais Lake	bF	22		70					
Hoffman Twp	bF	6		43					
Jollineau Twp	bF						2	2	2
	wS						0	0	0
Pine Twp									
- km 34.6 Aubinadong Rd	bF	7	22	42	49	74	69	91	
	bS						8	14	10
- km 31.1 Aubinadong Rd	bF	9	27	52	59	80	92	94	
	wS						20	56	52
Pine Twp									
- km 31.1 Aubinadong Rd	bS						16	36	28
Smilsky Twp	bF	44	93	100					
Snow Twp	bF					19	25	43	63
	wS						0	2	2
Wlasy Twp - Dyson Lake	bF	29		66		73		90	

cont'd.

Table 7. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (cont'd.)

Location	Host	Tree mortality (%)							
		1975	1976	1977	1978	1979	1980	1981	1982
Sudbury District									
Antrim Twp - Halfway Lake	bF	62	86	94	97				
	wS	0	0	8					
- Halfway Lake Prov. Pk.	bF						66	71	91
	wS						20	0	4
Attlee Twp									
- Tyson Lake (1980 Sale Twp)	bF						68	58	88
	wS						25	10	13
Beaumont Twp									
- Graveyard Lake	bF	89		87		74			
- Helen Lake	bF	81		62					
Botha Twp - Rome Lake Rd	bF	82		94					
- near Morin lake	bF	65		82		96			
Cascaden Twp - Cascaden Rd	bF						37		
- Ministic Lake Rd	bF						24	31	50
	bS								66
Dunbar Twp - Scotia Lake	bF	93		88	81	96			
Ellis Twp - Scarecrow Lake	bF			40	35	41		65	52
Emo Twp - Onaping Lake	bF	54		69	91	90			
Fairbairn Twp - Onaping Lake	bF	68		63	98				
Hawley Twp									
- Nepawassi Lk. Rd	bF						74	85	36
	wS						21	9	6
Howey Twp - Laundrie Lake	bF			59	53	88			
Muldrew Twp - Elboga Lake	bF	54	71	54	93	95			
Munkster Twp - Rome Lake Rd	bF	64		84	93	82			
Rhodes Twp - Richardson Lake	bF	30		69	92				
Seagram Twp - Linger lake	bF			16	34	62		86	81
Stobie Twp	bF						87		
	wS						33		
Sweeney Twp - Ayotte Lake	bF	67		80		94			
Telfer Twp	bF						65		
	wS						9		
Ulster Twp - Sideburn Lake	bF	38		79		95			
Temagami District									
Barr Twp - Mowat Landing	bF		7	24	62	83	97	97	
Best Twp	bF			11	21	35	49	77	92

cont'd.

Table 7. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (cont'd.)

Location	Host	Tree mortality (%)							
		1975	1976	1977	1978	1979	1980	1981	1982
Temagami District (cont'd.)									
Corley Twp									
- Smoothwater Lake	bF	11	56	74	96				
Delhi Twp - Wakimika Lake	bF			63	51	68			
Donovan Twp									
- Smoothwater Lake	bF	15							
- Lady Dufferin Lake	bF			36					
Eldridge Twp	bF			19	24	37	66	70	95
- Consolidated Bathurst Rd	wS								19
Flett Twp - Fanny Lake	bF			10	28	52			
Gillies Limit Twp - Bay Lake	bF		0	1	4	6	15	24	59
	wS							0	0
Hartle Twp	bF						52	68	83
	wS						4	6	9
Hebert Twp	bF				34	39			
Hebert Twp									
- East of Angle Lake	bF				33	53	57	77	93
Medina Twp	bF			32	58	78			
Milne Twp - Boyce Lake	bF			32	43	59			
Parker Twp - Florence Lake	bF			28	21	52		64	
Riddell Twp - Camp 16 Rd	bF			6	49	72	75	86	94
	wS							0	
Speight Twp									
- Mendelssohn Lake (S end)	bF	17			54	78			
- Mendelssohn Lake (N end)	bF	36	65	81					
Strathcona Twp	bF		4		38		94	99	
Trethewey Twp - Banks Lake	bF			41	83	91		96	
Vogt Twp	bF			21	28	61			
Wallis Twp	bF		33						
Timmins District									
Bartlett Twp - Scott Lake	bF				25	63	95	97	
Carnegie Twp	bF						0	0	0
	wS							0	0
English Twp - Ferrier Lake	bF				7				
Haggard Twp	bF					21	33	35	89
Hillary Twp	bF					3	29	90	96
Kidd Twp	bF					0			
McKeown Twp	bF					4	6	7	23
Semple Lake	bF				28				

cont'd.

Table 7. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past nine years. (concl.)

Location	Host	Tree mortality (%)							
		1975	1976	1977	1978	1979	1980	1981	1982
Wawa District									
Asselin Twp - Gargantua Rd	bF		15	23	46	61	68	67	69
- Gargantua Rd	wS					18	24	32	36
Beaudry Twp									
- Black Spruce Lake	bF	91		74		96			
Beauparlant Twp									
- McEwen Lake	bF	47		70		83		97	
Brimacombe Twp - Hwy 17	bF		4	16	19	20	23	29	21
Broome Twp	bF			82		89			
Cecile Twp	bF					34	59	77	92
Copenace Twp - Poon L.	bF	27		46					
Esquega Twp - Hwy 101	bF		8	15	13	12	32	49	58
	wS						0	0	0
Giles Twp - Coldwater R.	bF	31				45	34	39	27
Hallett Twp - Hoppy Lake	bF	71		98					
- Convey Lake	bF							80	86
	bS							34	36
Labelle Twp - Agawa	bF	8	14	19					
Laforme Twp - Hwy 651	bF	31	53	81	87	98			
LaRonde Twp - Hwy	bF		23	56	77	84	95	93	
Larson Twp									
- Little Agawa Lake	bF	48		75		82	91	90	
Makawa Twp - Woodesgoon Lake	bF					35	33		72
- Fire River	wS					17			
Michano Twp									
- Miskokomon Twp boundary	bF	63	89	92					
Mosambik Twp - Esnagi Lake	bF								28
	wS								0
Naveau Twp - High Falls Rd	bF	16	21	43	39	37	35	38	
	bS						2	4	
Nebonaionquet Twp									
- Anjigami Rd	bF	53							
Pukaskwa National Park									
- White Gravel River Trail	bF							14	14
- N. of White Gravel River Trail	bF							17	17
- Oiseau Bay	bF							12	17
- N. of Oiseau Bay	bF							3	6
Quill Twp - Budd Lake Rd	bF		95	96					
Rennie Twp	bF			2		43			
Runnalls Twp - Grey Owl Lake	bF	30		89		94			
Simpson Twp	bF					0			0
Tiernan Twp - Peller Lake	bF	40	61						

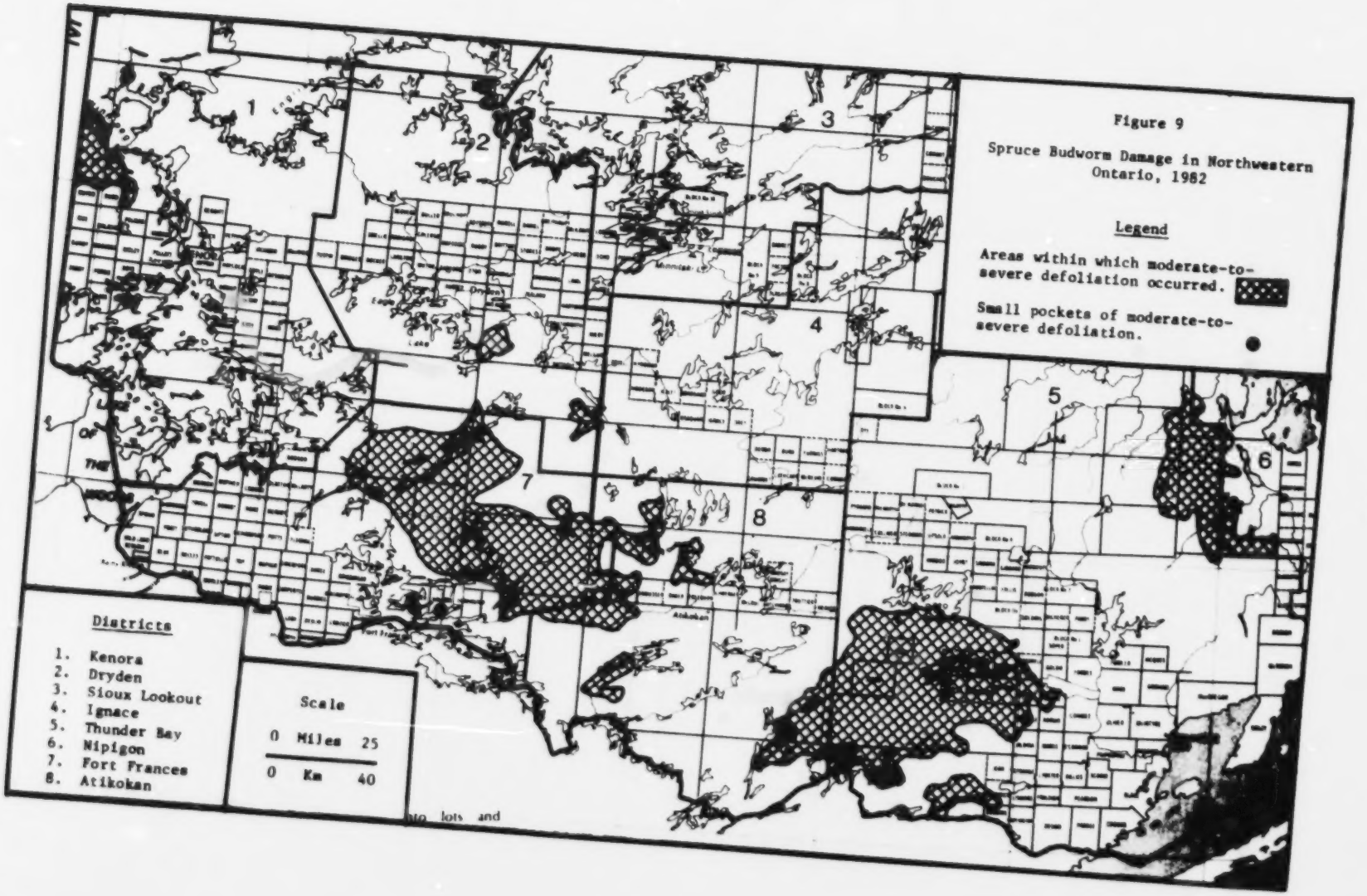


Figure 9
Spruce Budworm Damage in Northwestern Ontario, 1982
Legend
Areas within which moderate-to-severe defoliation occurred.
Small pockets of moderate-to-severe defoliation.
Districts
1. Kenora
2. Dryden
3. Sioux Lookout
4. Ignace
5. Thunder Bay
6. Nipigon
7. Fort Frances
8. Atikokan
Scale
0 Miles 25
0 Km 40
1
2
3
4
5
6
7
8

Infestation Forecasts for 1983: Egg-mass collections were made at a total of 66 locations in north central Ontario this year (Table 8). On the basis of a comparison of egg counts at 56 locations that were sampled in 1981 and 1982, there was an overall decrease of about 10%. Egg-mass densities actually increased in Geraldton (14%) and Nipigon (32%) but these increases were overshadowed by the 31% decrease reported in Terrace Bay District. The large increase in Nipigon District is somewhat misleading in that it is mainly a result of substantial increases at two locations in the Poshkokagan Lake infestation. Much smaller increases occurred at the other locations. Average overall egg-mass densities (per 9.29 m^2 of foliage) were 431 in both Geraldton and Terrace Bay districts and 117 in Nipigon.

On the basis of the results of the 1982 egg-mass survey, it is expected that some westward expansion of the main infestation will occur in Terrace Bay District in 1983 (Fig. 7). In Geraldton District some boundary changes are likely but the overall situation is not expected to change dramatically. Some eastward expansion is possible in that portion of the Poshkokagan Lake infestation in Nipigon District (Fig. 10).

Tree Mortality: In 1981, budworm-associated tree mortality was reported for the first time in north central Ontario in Lecours Township (approximately 10 ha). In 1982, two new pockets of mortality totalling approximately 2,870 ha were detected. One pocket was found straddling O'Neill and Pie townships east of Marathon and the other near the town of Manitouwadge. Balsam fir mortality in the Manitouwadge area was about 5%. Estimates of the amount of mortality are not available for the other locations because of their inaccessibility. Also, because the area of mortality is small and very recent, depletion estimates are not available.

Northwestern Ontario

Situation in 1982: In northwestern Ontario, the area of moderate-to-severe defoliation increased by 273,000 ha this year to a total of 931,000 ha (Fig. 9). A number of boundary changes were evident in the infestation in the Fort Frances District between Bennett Township and Lower Manitou Lake. These boundary changes account for an increase of 70,118 ha: the infestation now totals 352,474 ha and extends from White Otter Lake in Atikokan District to Stoneham Lake in Fort Frances District. This infestation has been present since 1974 and considerable mortality of balsam fir has resulted. Similarly, changes around the edges of the infestation between Kawnipi Lake in Atikokan District and Lower Shebandowan Lake in Thunder Bay District resulted in a net increase of 70,678 ha, for a total of 371,325 ha of moderate-to-severe defoliation. This infestation now stretches from Horne Township in Thunder Bay District to Agnes Lake in Atikokan District. The infestation in the Poshkokagan Lake area of Thunder Bay District, which decreased in 1981, expanded to the north and southwest and now totals some 124,500 ha, extending from Kabatotikwia Lake southeast to Black Mountain Lake in Nipigon District. Small infestations in the Sandstone and Arrow Lakes area of Thunder Bay District merged to form a single infestation of about 16,440 ha.

Table 8. North Central Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983.

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Geraldton District (28 locations)					
*Bicknell Twp					
- km 36.5, Pagwa Rd	bF	95	838	S	3
	wS	81	1935	S	3
*Boyce Twp					
- New Access Road	bF	96	209	S	4
- 88 cut near Island in Pagwa River	bF	100	397	S	3
	wS	87	916	S	3
Caramat Rd					
- 2.8 km south of Hwy 11	bF	7	30	L-M	0
- km 24	bF	25	200	M-S	0
Catlonite Rd - km 115.7	bF	1	0	0	0
*Clavet Twp					
- Check Plot 1, Jinx Lake	bF	88	387	S	3
	wS	79	458	S	3
	bS	44	173	M-S	0
- Plot A, Hwy 11, E of W Twp Line	bF	82	281	S	3
	wS	88	1085	S	3
- Plot B, Pagwa R. Rd	bF	95	197	S	3
	wS	95	1318	S	3
- Plot E, Hwy 11, 4.5 km E of W Twp Line	bF	13	128	M-S	3
	wS	32	173	M-S	3
Croll Twp	bF	10	20	L-M	0
Eastside Lake					
- east of, 83 cut	bF	100	175	M-S	4
	wS	78	277	S	3
	bS	7	170	M-S	0
Hwy 11 - SE of Nibs Lake	bF	100	222	S	3
Hwy 11 - W of Pipeline, Check Plot 3	bF	58	246	S	2
	wS	42	1162	S	3
Industrial Rd - 1.3 km S of Caramat	bF	50	176	M-S	0
++Kimberly-Clark					
- Seed Production Area	wS	2	57	L-M	0
Klotz Lake Prov. Pk	bF	22	80	M-S	0
Wintering Lake Rd - km 89.8	bF	4	0	0	0

cont'd.

Table 8. North Central Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Nipigon District (9 locations)					
Black Sturgeon Lake	wS	86	491	S	2
Kilkenny Twp - Macdiarmid	bF	0	13	L	0
Legault Twp	bF	0	23	L-M	0
Muskrat Lake - 3.2 km S of Parks Lake	bF	22	341	S	1
- km 48, Domtar Rd	bF	4	0	0	0
Patience Twp - Jackpine River	bF	0	27	L-M	0
Shillabeer Creek	bF	3	42	L-M	0
Sturge Lake	bF	1	26	L-M	0
Summers Twp	bF	2	0	0	0
Terrace Bay District (29 locations)					
+Agonzon Lake - Stand 459	bF	48	398	S	0
*Barbara Lake - OMNR Tree Seed Production Area[c]	wS	5	1605	S	0
+Bomby Twp - Stand 396	bF	75	310	S	1
Brothers Twp	bS	38	1958	S	1
+Camp 60 Rd - N of Billet Lake Rd, Stand #377	bF	95	701	S	2
Catlonite Rd - km 46.7, Monitor Plot	bF	3	40	L-M	0
Coubran Lake	bF	61	237	M-S	0
+Gowan Lake - Stand 269	bF	95	437	S	2
+Herbert Twp - Ice Cream Lake, Stand 525	bF	41	355	S	2
Hourglass Lake	bF	88	273	S	2
+Hwy 614 - E of Barehead Lake, Stand 360	bF	97	843	S	2
	wS	63	1869	S	2
- S of Billet Lake, Stand 561	bF	96	819	S	2
- Stand 312	bF	98	1228	S	3
Industrial and Camp 15 Rd	bF	68	611	S	1
Killraine Twp - Rainbow Falls Prov. Pk	bF	2	39	L-M	0

cont'd.

Table 8. North Central Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (concl.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Terrace Bay District (29 locations) (cont'd.)					
+Lecours Twp - Stand 364	bF	98	922	S	3
+Lunny Lake - Stand 201	bF	75	723	S	2
McCoy Twp					
- 3.1 km E of Mink Creek	bF	41	163	M-S	0
*Neys Prov. Pk	bF	50	159	M-S	0
	wS	23	189	M-S	0
Pic Twp					
- Black River, Hwy 17	wS	18	538	S	1
Priske Twp - Hays Lake	bF	85	180	M-S	1
Stevens - Microwave Tower	bF	94	326	S	1
Syine Twp					
- Jackfish Lake					
Monitor Plot	wS	72	231	S	0
Tuuri Twp - Santoy Lake	bF	18	21	L-M	0
+Wabikoba Rd - Stand 616	bF	100	803	S	3
Walsh Twp - Ripple Lake	bF	8	33	L-M	0
Wiggins Twp					
- 1.6 km E of Gravel River	bF	0	28	L-M	0

[a] S = severe, M = moderate, L = light, 0 = nil

[b]

Code	Categories
0	undamaged
1	light damage: <25% *total defoliation*, usually one season of severe defoliation.
2	moderate damage: 25% to 60% *total defoliation*, two or three seasons of severe defoliation.
3	severe damage: 60% to 80% *total defoliation*, three to five seasons of severe defoliation, will recover.
4	moribund or dying: 80% to 100% *total defoliation*, crowns grey in appearance, top dead or bare 50 cm to 150 cm.
5	less than 25% of *stand* dead.
6	25% to 50% of *stand* dead.
7	50% to 70% of *stand* dead.
8	more than 70% of *stand* dead.

[c] Ground sprayed, Orthene, 1982

* Samples requested by OMNR

+ Samples from Ontario Paper Co. Ltd. Limits

++Samples requested by Kimberly-Clark of Canada Ltd.

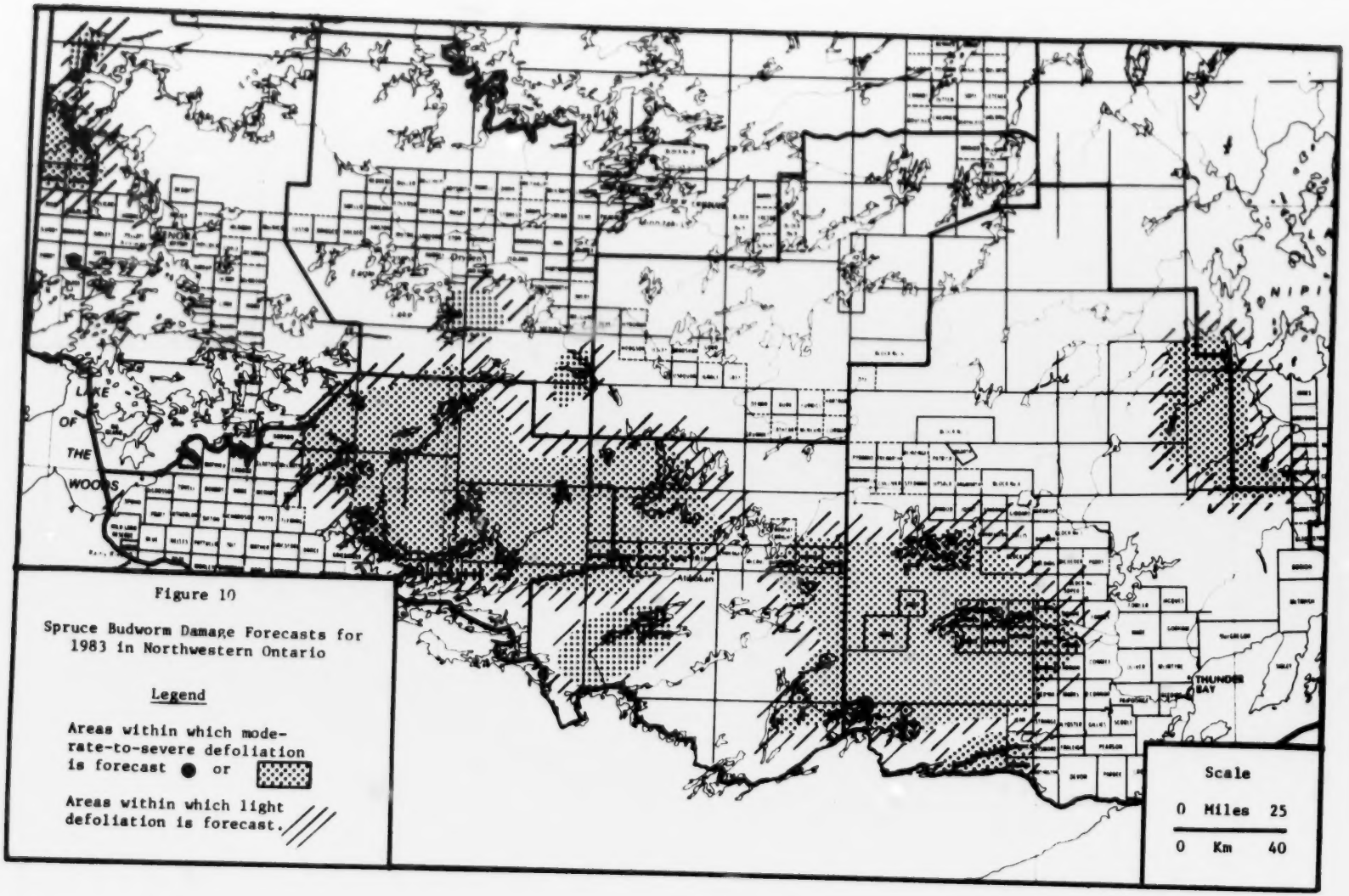


Figure 10

Spruce Budworm Damage Forecasts for 1983 in Northwestern Ontario

Legend

Areas within which moderate-to-severe defoliation is forecast ● or

Areas within which light defoliation is forecast.

Similarly, infestations at Wolseley and Beaverhouse lakes in Atikokan District merged to form a single infestation of 16,659 ha.

A number of new medium-to-heavy infestations were discovered in northwestern Ontario in 1982. The largest, approximately 26,962 ha, occurs in Kenora District, along the Manitoba border between Eaglenest and Mantario lakes, and extends southeast to Signet Lake. Other small areas of new infestation, totalling 19,727 ha, were located as follows: west of Umfreville Lake, Kenora District, in the adjoining townships of Kalkirk and Wattan and in the Kishkutena Lake area of Fort Frances District, north and south of Pickerel Lake and between Stormy and Wapageisi lakes in Dryden District, and in the vicinity of Crowrock and Eye lakes in Atikokan District. The small infestation at Umfreville Lake, Kenora District increased to 3,069 ha on the east and west sides of the lake and a small infestation of about 200 ha on the shorelines and islands of Moar Lake in Red Lake District remained at approximately the same level as in 1981. The infestation at Moar Lake is 250 km north of Kenora and is nearly 180 km from the nearest known infestation in Ontario.

Infestation Forecasts for 1983: As a result of the expansion of budworm infestations in this part of the province duing the last two years, and the detection of new areas of infestation in 1982, the total number of locations sampled for egg-mass counts increased this year to 145 (Table 9). On the basis of a comparison of 108 locations sampled in 1981 and 1982, there was an overall increase in egg-mass densities of about 60%. Egg counts increased substantially in all districts with the largest occurring in Atikokan (136%), Kenora (117%) and Fort Frances (80%) districts. Egg-mass densities were high at six new locations in Dryden District but were low at the new location in Ojibway Provincial Park, Sioux Lookout District.

Forecasts, based on the results of this year's egg-mass survey, call for a substantial increase in the area of moderate-to-severe defoliation throughout northwestern Ontario in 1983 (Fig. 10). It is expected that the area of defoliation will double in extent to approximately 2.0 million ha. Each of the three major infestations (Fort Frances, Thunder Bay-Atikokan and Poshkokagan Lake) is expected to expand in all directions, merging with some of the smaller infestations in its vicinity.

Tree Mortality: In northwestern Ontario the area of budworm-associated tree mortality increased by some 62,000 ha to a total of 150,000 ha (Fig. 11). The area of tree mortality continued to expand in Fort Frances District, and in Thunder Bay District some 39,000 ha of new tree mortality were mapped. Here, pockets of balsam fir mortality were detected south of Moss Township along the Wawiag River, in the Myrt and Plummer lakes area and west to the south end of Ross Lake and in Begin and Lamport townships south of Shebandowan Lake. Balsam fir mortality in the six new plots established in these areas averaged 24% (Table 10). Approximately 7,500 ha of light mortality were detected in Atikokan District west of Tanner Township along the Fort Frances border. So far, budworm impact in this area has been relatively light in comparison with that in southern and northeastern Ontario, with only about 100,000 m^3 of wood lost through tree mortality. However, if the current infestations continue to expand and intensify, then budworm-associated impact figures will undoubtedly show a corresponding increase.

Table 9. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983.

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Atikokan District (30 locations)					
Agnes Lake	bF	81	482	S	3
Allan Lake	bF	5	70	M	0
Basswood Lake - Prairie Portage	bF	11	19	L-M	1
Beaverhouse Lake	bF	35	1173	S	1
Burton Lake - south of	bF	100	2050	S	3
Cache Bay	bF	96	1754	S	3
Clearwater West Lake	bF	31	179	M-S	1
Crowrock Lake	bF	59	201	M-S	2
Eye Lake	bF	13	212	M-S	1
Factor Lake	bF	91	1787	S	3
	bS	79	422	S	3
Flood River	bF	0	168	M-S	0
French Lake	bF	0	174	M-S	0
Greer Lake	bF	6	0	0	1
Irene Lake	bF	2	49	L-M	0
Joe Lake	bF	69	885	S	2
Kawa Bay	bF	89	1266	S	2
Kawnipi Lake - Divine Creek	bF	70	1458	S	3
Little Eva Lake	bF	3	98	M-S	0
McKenzie Lake	bF	81	1154	S	2
Melema Lake	bF	1	142	M-S	0
Norway Lake	bF	1	20	L-M	0
Oriana Lake	bF	3	34	L-M	0
Poohbah Lake	bF	7	184	M-S	0
Quetico Lake	bF	2	215	M-S	0
Sturgeon Lake - west end	bF	7	17	L-M	0
Thompson Lake	bF	4	103	M-S	0
Tuck Lake	bF	5	35	L-M	0
White Otter Lake	bF	68	543	S	1
Wolseley Lake	bF	10	503	S	1
Dryden District (6 locations)					
Dore Lake	wS	4	171	M-S	1
Eagle Lake	bF	0	71	M-S	0

cont'd.

Table 9. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Dryden District (6 locations) (cont'd.)					
Ingall Lake	bF	27	636	S	1
Kawashegamuk Lake	bF	28	220	M-S	1
Stormy Lake	bF	20	314	S	1
Wapageisi Lake	bF	22	247	S	1
Fort Frances District (29 locations)					
Bear Pass - km 2.4 west	bF	55	1528	S	2
Bennett Lake	bF	89	1328	S	5
Big Sawbill Lake	bF	1	178	M-S	0
Boffin Lake - northeast side	bF	0	76	M-S	0
Carleton Lake	bF	26	682	S	1
Eltrut Lake	bF	98	764	S	4
Entwine Lake	bF	50	280	S	1
Eric Lake	bF	24	339	S	1
	bS	2	152	M-S	0
Jones Lake	bF	69	1888	S	1
Kaiarskons Lake	wS	5	953	S	1
	bS	1	212	M-S	0
Katimiagamak Lake	bF	1	62	M-S	0
Kawawia Lake	bF	99	1074	S	1
*Lake of the Woods Prov. Pk	wS	0	22	L-M	0
Lawrence Lake	bF	73	297	S	1
	bS	1	78	M-S	0
Little Turtle Lake Rd - km 15	bF	3	373	S	1
Makomesut Lake - southeast side	bF	64	1278	S	2
Manion Lake Rd - km 23.2	bF	94	1032	S	3
Manitou Stretch	bF	99	1231	S	4
Mount Lake	bF	60	366	S	1
Penassi Lake	bF	10	344	S	0
	bS	1	278	S	0
Pipestone Lake - east end	bF	6	441	S	0
Potts Twp	bF	0	21	L-M	0

cont'd.

Table 9. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983.

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Fort Frances District (29 locations) (cont'd.)					
Rainy Lake - Ash Bay, west end	bF	0	374	S	0
Sphene Lake	bF	0	105	M-S	0
Vickers Lake	bF	99	969	S	3
Ignace District (2 locations)					
Skey Twp	bF	0	0	0	0
Smirch Lake	bF	2	47	L-M	0
Kenora District (11 locations)					
Cygnet Lake	bF	4	230	M-S	1
- plantation	wS	0	0	0	0
Forgie Twp - Rush Bay Rd	bF	81	1065	S	1
North Scot Lake	bF	68	806	S	1
Pelican Pouch Lake	bF	0	63	M	0
Roughrock Lake	bF	0	16	L-M	0
Rowan Lake - south	bF	0	30	L-M	0
Sand Lake - southwest side	bF	0	57	L-M	0
Tetu Lake - north end	bF	1	239	S	1
Umfreville Lake - central	bF	0	14	L	0
- west end	wS	47	589	S	2
Thunder Bay District (65 locations)					
Abitibi-Price Camp 230 - 1.6 km W of	bF	2	88	M-S	0
Aldina Twp	bF	88	787	S	2
Arrow Lake	bF	32	252	S	1
Bedivere Lake	bF	10	73	M-S	1
Blackwell Twp	bF	2	100	M-S	0

cont'd.

Table 9. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Thunder Bay District (65 locations) (cont'd.)					
Burchell Lake	bF	91	649	S	3
- *Southwest end, Stand #312	bF	100	1244	S	3
Camp 45					
- Great Lakes Forest Products Co.	bF	98	330	S	3
- km 1.6 on Camp Rd	bF	36	222	S	2
Cheeseman Lake					
- km 130 Hwy 527	bF	71	388	S	2
Circle Lake - 4.8 km W of	bF	80	226	S	2
Conacher Twp - Drift Lake Rd	bF	20	119	M-S	1
Crayfish Lake	bF	85	1654	S	3
Flatrock Lake	bF	18	86	M-S	0
Forbes Twp - N of Flett	bF	2	33	L-M	0
*Fountain Lake - Stand #639	bF	100	448	S	3
Fowler Twp					
- SW of Hawkeye Lake	bF	2	45	L-M	0
Glen Twp - Wolf Lake Road	bF	4	18	L-M	0
Golding Twp - Microwave Tower	bF	0	9	L	0
Gorham Twp					
- S of Stepstone	bF	0	0	0	0
Greenwater Lake - east side	bF	98	2311	S	3
- Shelter Island	bF	100	1586	S	3
Greenwood Lake	bF	100	436	S	3
*Grouse Lake - Stand #591	bF	100	1750	S	3
Hagey Twp - Hwy 586	bF	92	728	S	3
Haines Twp - Postans	bF	88	422	S	3
Hood Lake	bF	100	905	S	3
Hoof Lake	bF	98	1283	S	3
Kabitotikwia Lake	bF	7	662	S	1
*Kegmus Lake - Stand #152	bF	100	291	S	3
Kekekuab Lake	bF	54	218	S	3
Lac Des Mille Lacs					
- Baril Bay	bF	42	404	S	2
- Bolton Bay	bF	17	262	S	1
- Poplar Point	bF	7	116	M-S	0
*Little Poshkokagan Rd					
- Stand #159	bF	100	193	M-S	3
Marks Lake	bF	16	168	M-S	1

cont'd.

Table 9. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983.

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Thunder Bay District (65 locations) (cont'd.)					
*Martin Mountain Rd - Stand #29	bF	100	268	S	3
*Matawin Road - OMNR Tree Seed Orchard	wS	0	76	M-S	0
Mawn Lake - NE of	bF	0	47	L-M	0
McGinnis Lake	bF	100	1330	S	3
McTavish Twp - M.T.C.	wS	2	18	L-M	0
Moss Lake - Stand #660	bF	100	1912	S	3
Mountain Lake	bF	13	135	M-S	0
Northern Light Lake - Curran Bay	bF	98	516	S	3
- Trout Bay Rd km 16.4	bF	98	536	S	3
	bS	88	453	S	3
North Fowl Lake Rd - km 3.7 S of	bF	6	24	L-M	1
*O'Connor Twp - OMNR Tree Seed Orchard	wS	0	0	0	0
- OMNR Tree Seed Production Area	wS	3	56	M	0
*Pearson Twp - OMNR Tree Seed Orchard	wS	0	0	0	0
Plummes Lake	bF	95	443	S	3
Ross Lake	bF	100	855	S	4
Sandstone Lake	bF	89	804	S	3
Scoble Twp - S of Oliver Lake	bF	0	29	L-M	0
Shebandowan Lake - Sawmill Bay	bF	100	603	S	3
	bS	90	2052	S	3
*Squeers Creek, North of - Stand #275	bF	100	811	S	3
- *South of - Stand #526	bF	100	697	S	3
Squeers Lake - W of	bF	100	334	S	3
Sump Lake	bF	100	511	S	3
*Swallow Lake - SE side - Stand #168	bF	100	1391	S	3
- *NE side - Stand #170	bF	100	1304	S	3
*Thunder Bay - OMNR Tree Nursery	wS	1	183	M-S	0
Ware Twp	bF	0	304	S	0
Wolf River Rd - km 28	bF	2	0	0	0

cont'd.

Table 9. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1982, and infestation forecasts for 1983. (cont'd.)

Location	Host	Estimated % defoliation 1982	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1983[a]	Accumulated damage[b]
Red Lake District (1 location)					
Moar Lake	bf	64	239	M-S	1
Sioux Lookout District (1 location)					
Ojibway Prov. Pk	bf	0	12	L	0

[a] S = severe, M = moderate, L = light, 0 = nil

[b]

Code	Categories
0	undamaged
1	light damage: <25% *total defoliation*, usually one season of severe defoliation.
2	moderate damage: 25% to 60% *total defoliation*, two or three seasons of severe defoliation.
3	severe damage: 60% to 80% *total defoliation*, three to five seasons of severe defoliation, will recover.
4	moribund or dying: 80% to 100% *total defoliation*, crowns grey in appearance, top dead or bare 50 cm to 150 cm.
5	less than 25% of *stand* dead.
6	25% to 50% of *stand* dead.
7	50% to 70% of *stand* dead.
8	more than 70% of *stand* dead.

*Samples requested by OMNR

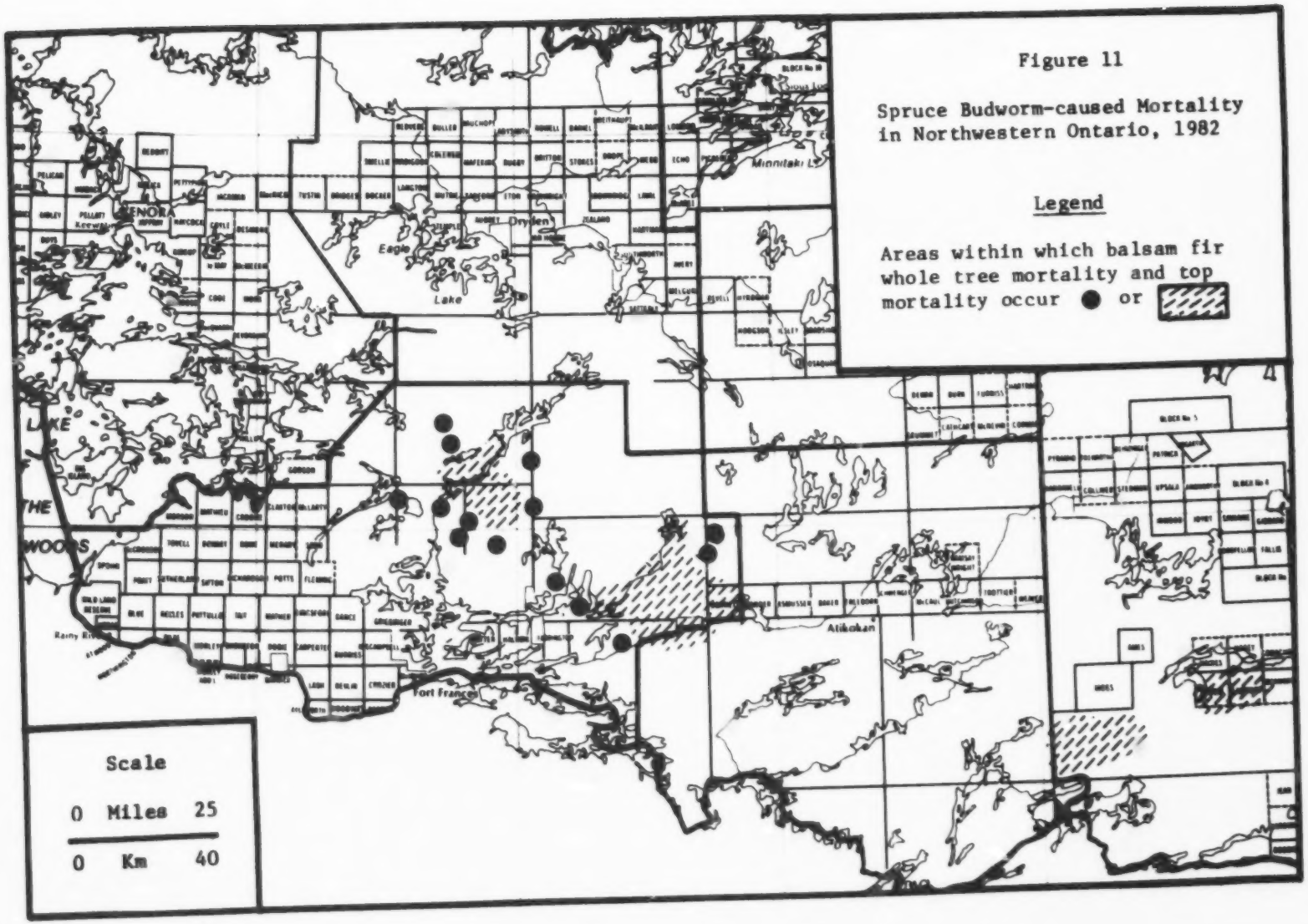


Figure 11
Spruce Budworm-caused Mortality in Northwestern Ontario, 1982
Legend
Areas within which balsam fir whole tree mortality and top mortality occur ● or
Scale
0 Miles 25
0 Km 40
Dryden
Eagle Lake
Atikokan
Fort Frances
Rainy River
Minnitaki Lake
KENORA
LAKE
THE
WOODS

Table 10. Northwestern Ontario - Summary of spruce budworm-associated tree mortality based on ground checks for the past six years.

Location	Host	Tree mortality (%)					
		1977	1978	1979	1980	1981	1982
Fort Frances District							
Bat Lake Rd - km 13.0	bF			5	12		
- km 15.3	bF			17	23		
Bennett Lake - north of	bF		38				
Eltrut Lake	bF					5	6
Harris Lake	bF					9	4
Hillyer Creek - south of	bF		35				
- southeast of	bF		32				
Little Turtle River	bF	76					
- Falls	bF		73				
- North of	bF	64					
Manitou Stretch	bF						11
Petite Lake	bF						13
Strong Lake	bF					7	9
Thunder Bay District							
Dakota Lake - SE side	bF						10
Greenwater Lake - SE side	bF						26
Myrt Lake - South of	bF						41
Ross Lake - SW side	bF						27
Saganagons Lake Rd Jct	bF						17
Saganagons Lake Rd - 2 km from Jct	bF						23

PART B: AERIAL SPRAYING OPERATIONS

INTRODUCTION

In 1982, aerial spraying operations were conducted against the spruce budworm in high-value forests and commercial forests in the northern Ontario districts of Hearst, Kapuskasing and Temagami. A total of 3,454 ha were treated in late May and June with a variety of chemical and biological insecticides. Approximately 10% (361 ha) of the total area was treated with either a single application of Matacil, a double application of Orthene or a single application of Orthene followed by Matacil. The remaining 3,093 ha (90%) of forest were treated with various formulations of the biological insecticide *Bacillus thuringiensis (B.t.)*. Dipel 88 was applied to 2,744 ha; Novabac 3-e was applied to 247 ha; and two formulations of Thuricide, 32B and 48B, were applied to 102 ha. Areas sprayed included commercial forests (1,842 ha), seed production areas (120 ha), provincial parks (1,151 ha), plantations (136 ha), a moose yard (180 ha), and a white spruce experimental block (25 ha). A summary of the 1982 spruce budworm aerial spraying program is provided in Table 11.

Spruce budworm larval development is summarized in Table 12. In Temagami District emergence of second-instar larvae began around 5 or 6 May, and in Hearst District about 11 or 12 May. In these areas these are the approximate dates when budworm emergence occurs in a 'normal' year. However, warm day weather in May resulted in rapid development of the larvae in many areas. On 3 June in Hearst District, budworm larvae were at the peak of the fourth instar, almost a full instar ahead of normal. This rapid development slowed somwehat in June as a result of less favorable weather conditions.

OMNR was responsible for the logistics of the spray operations. The CFS provided the biological information necessary for the planning and timing of operations and biologically assessing the various treatments. In addition, aerial and ground surveys to map the extent of spruce budworm defoliation and to determine, by egg-mass counts, damage forecasts for 1982 were carried out by FIDS field technicians using some 300 hours of aircraft time provided by OMNR.

The results of the various spray treatments used in Ontario in 1982 are summarized in tables 13 to 18. Basic data such as pre- and post-spray population densities, larval mortality (due to treatment) and foliage protection are presented in each table.

1982 Operations and Results: In 1981 the Ontario Ministry of Natural Resources attempted to protect female flowers in Seed Production Areas (SPA) from budworm feeding with an early or pre-emergence application of Matacil followed by a second application 5-7 days later. Flower development, rather than budworm development, was used to time this operation. Assessment of this program was difficult because of the lack of flower production in 1981. In 1982, a similar pro-

Table 11. Summary of aerial spraying in Ontario against spruce budworm in 1982.

Location	Area (ha)	Date sprayed	Treatment
Temagami District			
South Lorrain Twp (2 SPAs)[a]	22	30, 31 May 3, 4 June	Orthene 85 SP, 560 g/9.4 L/ha 2 applications
Kapuskasing District			
Owens Twp SPA	10	9 June	Novabac 3-e, 20 BIU/7.0 L/ha 1 application
Fauquier Twp SPA	65	9 June	Novabac 3-e, 20 BIU/7.0 L/ha 1 application
Hearst District			
Arnott Twp SPA	16	6 June	First application Orthene 85SP, 560 g/9.4 L/ha
		12 June	Second application Matacil 1.8D 90 g/9.4 L/ha
Hanlan Twp SPA	7	6 June	First application Orthene 85SP, 560 g/9.4 L/ha
		13 June	Second application Matacil 1.8D 90 g/9.4 L/ha
Chelsea Twp Moose Yard	180	12 June	Matacil 1.8D, 90 g/4.7 L/ha, 1 application
Rogers Twp Plantation 43	136	17 June	Matacil 1.8D, 90 g/3.0 L/ha, 1 application
Fushimi Provincial Park	481	16, 17 June	Dipel 88, 20 BIU/5.9 L/ha 1 application
Nagagamisis Provincial Park	593	13,14,16 June	Dipel 88, 20 BIU/5.9 L/ha 1 application
	77	16 June	Thuricide 32B, 20 BIU/5.9 L/ha 1 application
McEwing Twp - Block B	465	12,13,16 June	Dipel 88, 20 BIU/5.9 L/ha 1 application
	172	14 June	Novabac 3-e, 20 BIU/5.9 L/ha 1 application
- Block C	900	11,12,14 June	Dipel 88, 20 BIU/5.9 L/ha 1 application
- Block A	305	8 June	Dipel 88, 13 BIU/5.9 L/ha 1 application
Frost Township Experimental Blocks	25	16 June	Thuricide 48B, 30 BIU/2.36 L/ha 1 application
	3454		

Program Total = 3454 ha

[a] SPA - Seed Production Area

Table 12. Spruce budworm larval development, 1982.

Area	Date	Tree species	Larval Development (%) II	III	IV	V	VI	Pupae
Hearst District								
Arnott, Frost and McEwing twps	May 11	bF			Emergence			
		wS			"			
	June 3	bF		32	68			
		wS		24	44	32		
	June 8	bF			32	68		
		wS			4	72	24	
	June 9	bF			20	60	20	
		wS		8	8	36	48	
	June 10	bF			18	78	4	
		wS			12	56	32	
	June 16	bF			8	52	40	
		wS				16	84	
	June 28	bF			12	24	62	2
Rogers Twp	May 12	bF			Emergence			
		wS			"			
	June 1	bF		44	44	12		
		wS	4	40	52	4		
	June 9	bF			8	32	60	
		wS		4	16	28	52	
	June 17	bF				12	88	
		wS				20	80	
	June 29	wS			7	16	50	27
Kapuskasing District								
Idington Twp	June 16	wS				28	72	
Owens Twp	June 16	bS			16	36	48	

gram was planned to protect four white spruce SPAs, two in Temagami District and two in Hearst District. This year, however, the first application of insecticide was scheduled to go on at the first sign of budworm emergence. Several unforeseen problems delayed the first spray by some three weeks in both districts. As a result, this year's operation cannot be assessed in terms of flower protection, although good cone crops were observed in all areas, but has been assessed in terms of population reduction and foliage protection. In Temagami District, the two SPAs, Friday Lake and Matabitchuan, were treated with a double application of Orthene. The first application was on 30 May when budworm were predominantly third and fourth instars and was followed by a second application on 3 June. Results of this particular operation were excellent in terms of both larval mortality and foliage protection (Table 13). The two SPAs in Hearst District, Arnott and Hanlan, were each to be treated with a single application of Orthene followed by an application of Matacil five to seven days later. The Orthene was applied on 6 June when the budworm larvae were in the fourth and fifth instars, and the Matacil was applied on 12 June. Results of this operation were not quite as good as in Temagami in terms of population reduction, but in terms of foliage protection this, too, was a very successful program (Table 14).

The chemical insecticide Matacil was also used to treat two other areas in Hearst District: a white spruce plantation in Rogers Township and a balsam fir moose yard in Chelsea Township. This is the third consecutive year that an aerial spraying program has been conducted in a wildlife management area. In 1980 and 1981, a successful program of foliage protection was undertaken in a deer yard in Parry Sound District. The Chelsea Township moose yard was treated on 12 June when the majority of budworm larvae were in the fifth instar. Because of the lateness of this spray, foliage protection was not what it could have been (Table 15), even though larval mortality due to treatment was very high. In the Rogers Township plantation, where population reduction was relatively poor, defoliation on both balsam fir and white spruce was light. This is undoubtedly due to the relatively low pre-spray populations in this area which, it should be noted, was treated with Matacil in 1981.

As was mentioned earlier, 90% of this year's budworm spraying program involved the use of the biological insecticide *B.t.* In Kapuskasing District, two SPAs were treated with the *B.t.* product Novabac 3-e. Very low pre-spray populations in both of these SPAs make assessment impracticable (Table 16). However, the same product was tested in 172 ha of one of the commercial spray blocks in McEwing Township, Hearst District. The results in Table 16 indicate that Novabac 3-e was very effective on the balsam fir and somewhat less effective but still very acceptable on white spruce. Another *B.t.* product, Thuricide 48B, was tested on a 25-ha block of white spruce in Frost Township. Results of this particular test were rather poor in terms of population reduction; however, some foliage protection was provided (Table 16).

The main material used in the 1982 aerial spraying program in Ontario was another *B.t.* product, Dipel 88, which was applied to almost 80% of the forests treated. It was used extensively in Hearst District in

Table 13. Population reduction, pupal survival and foliage protection attributable to two applications of Orthene (560 g/9.4 L/ha) on high-value stands in Temagami District in 1982.

	Host	Prespray larvae per 46-cm branch tip	Surviving pupae per 46-cm branch tip	Population reduction due to treatment (%)	1982 Defoliation (%)
Friday Lake SPA	wS	14.6	0.3	93	6
Check	wS	20.6	5.7		34
Matabitchuan SPA	wS	11.3	0.1	97	10
Check	wS	20.6	5.7		34

Table 14. Population reduction, pupal survival and foliage protection attributable to an aerial application of Orthene (560 g/9.4 L/ha) followed by an application of Matacil (90 g/9.4 L/ha) in Hearst District in 1982.

	Host	Prespray larvae per 46-cm branch tip	Surviving pupae per 46-cm branch tip	Population reduction due to treatment (%)	1982 Defoliation (%)
Arnott SPA	wS	28.3	0.4	76	20
Check	wS	22.3	1.4		52
Hanlan SPA	wS	7.4	0.1	92	1
Check	wS	18.4	3.5		70

Table 15. Population reduction, pupal survival and foliage protection attributable to a single aerial application of Matacil in Hearst District in 1982.

	Host	Prespray larvae per 46-cm branch tip	Surviving pupae per 46-cm branch tip	Population reduction due to treatment (%)	1982 Defoliation (%)
Matacil 90 g/4.7 L/ha					
Chelsea Twp Moose Yard	bF	24.7	0.6	93	54
Check	bF	19.8	6.7		76
Matacil 90 g/3.0 L/ha					
Rogers Twp Plantation #43	bF	5.6	1.1	50	12
Check	bF	21.3	8.4		74
Rogers Twp Plantation #43	wS	7.1	0.3	77	9
Check	wS	24.2	4.4		35

two provincial parks and three blocks of commercial forests that are scheduled for harvest within the next five years. Results of the Dipel 88 treatments are shown in Table 17. Both Fushimi and Nagagamisis provincial parks were sprayed between 13 and 17 June when budworm larvae were in the fourth to sixth instars. While budworm mortality was not spectacular, a greater degree of foliage protection could have been afforded with an earlier application. Relatively better results were attained in the McEwing Township commercial blocks which were treated somewhat earlier (8-16 June) than the two parks. It has been observed in earlier programs that *B.t.* is generally more effective on balsam fir than on spruce and an examination of tables 16 and 17 show that this trend continued in 1982.

Two ground spraying operations were conducted in the province this year. Both areas, the Bonner Tree Improvement Centre in Kapuskasing District and the Barbara Lake white spruce SPA in Terrace Bay District, were treated in 1981 and again in 1982 with the chemical insecticide Orthene. Because of extremely low pre- and post-spray populations in the Bonner Tree Improvement Centre, analysis of this operation was impossible. Excellent results were achieved at the Barbara Lake SPA which was sprayed on 11 June (Table 18).

In 1981, three high-value areas in the Northern Region were treated with the nuclear polyhedrosis virus (NPV). These treatments were carried out by OMNR with the help and cooperation of Dr. J.C. Cunningham (Forest

Pest Management Institute [FPMI], Sault Ste. Marie) and GLFRC. The three areas--Reeves Township SPA in Chapleau District, Rogers Township Plantation 31 in Hearst District and Idington Township Plantation 7 in Kapuskasing District--were sampled again in 1982 to determine if there had been any virus carryover. Larvae were collected periodically from each area and examined for the presence of NPV. Results indicate that very few larvae were infected with NPV (J.C. Cunningham, FPMI, personal communication). Very low budworm populations in two of the three plots made conventional assessment very difficult.

In the 1981 spruce budworm report the various problems and factors affecting the success or failure of aerial control operations were discussed. Factors such as population density, weather, type of pesticide, pilot experience, aircraft, and a score of others influence the effectiveness of each application of insecticide. In this respect, 1982 was no different from previous years. Of major concern this year was the rapid development of the early winter budworm larvae during May and early June. Fortunately, a cooling trend in June slowed budworm growth rates sufficiently to allow completion of spraying operations before larval development could reach the point at which treatment becomes ineffective.

In view of the lateness of some of the applications and the widespread use of *B.t.*, the overall results of the 1982 aerial spraying program were very good. The two chemical insecticides, Orthene and Matacil, used alone and in combination, provided excellent results in terms of both population reduction and foliage protection. Results in stands treated with the various *B.t.* formulations were very encouraging by virtue of the fact that, with the odd exception, they were consistently good. Inconsistency in results has been a major criticism of the bacterial insecticides used to date. As in previous years, the *B.t.* formulations used in 1982 were generally more effective on balsam fir than on white spruce.

Plans for 1983: Two events which occurred in 1982 will undoubtedly have an effect on the amount of aerial spraying conducted in 1983 and in subsequent years. The first, which was described earlier, is the dramatic decline in the area of budworm infestation that occurred in northeastern Ontario this year. The second event is the bumper crop of white spruce seed that was collected in northeastern Ontario in 1982. As a result of this crop, most OMNR districts are in the process of reviewing their SPA programs and the need for protection in these areas.

There are, however, plans to conduct aerial spraying operations on several thousand hectares of commercial forest in Hearst District. This district has also expressed interest in continuing protection spraying in the two provincial parks treated this year and in several white spruce plantations in Rogers Township that were treated in 1981.

Table 16. Population reduction, pupal survival and foliage protection attributable to aerial applications of Novabac 3-e *(B.t.)* and Thuricide 48B *(B.t.)* in 1982.

	Host	Prespray larvae per 46-cm branch tip	Surviving pupae per 46-cm branch tip	Population reduction due to treatment (%)	1982 Defoliation (%)
Novabac 3-e					
Kapuskasing Dist. 20 BIU/ 7.0 L/ha					
Owens Twp SPA	bS	2.3	0.1	0	2
Check	bS	0.7	0		0
Fauquier Twp SPA	wS	0.5	0	0	0
Check	wS	1.4	0		1
Fauquier Twp SPA	bS	0.3	0	0	0
Check	bS	0.2	0		0
Hearst Dist. 20 BIU/5.9 L/ha					
McEwing Twp Block B	bF	9.6	0.3	85	14
Check	bF	15.1	3.2		79
McEwing Twp Block B	wS	12.8	1.0	58	32
Check	wS	18.4	3.5		70
Thuricide 48B					
Hearst Dist. 30 BIU/2.4 L/ha					
Frost Twp Block 2	wS	12.9	2.4	4	37
Check	wS	18.4	3.5		70

Table 17. Population reduction, pupal survival and foliage protection attributable to aerial applications of Dipel 88 in Hearst District in 1982.

	Host	Prespray larvae per 46-cm branch tip	Surviving pupae per 46-cm branch tip	Population reduction due to treatment (%)	1982 Defoliation (%)
20 BIU/5.9 L/ha					
Fushimi Provincial Park	bF	26.2	1.2	77	32
Check	bF	25.0	5.1		43
Nagagamisis Provincial Park	bF	5.1	0.7	40	13
Check	bF	11.7	2.7		71
Nagagamisis Provincial Park	wS	19.7	2.1	43	33
Check	wS	18.4	3.5		70
McEwing Twp, Block B	wS	18.7	1.3	64	22
Check	wS	18.4	3.5		70
McEwing Twp, Block C	bF	22.9	0.4	92	36
Check	bF	15.1	3.2		79
McEwing Twp, Block C	wS	17.6	0.6	82	38
Check	wS	18.4	3.5		70
13 BIU/5.9 L/ha					
McEwing Twp, Block A	wS	15.0	1.4	52	25
Check	wS	18.4	3.5		70

Table 18. Population reduction, pupal survival and foliage protection attributable to a ground application of Orthene at the Barbara Lake SPA in Terrace Bay District in 1982. Orthene 75% AE was applied at a rate of 1.71 kg of product in 1,556 L of water per ha at peak of 3rd instar.

	Host	Prespray larvae per 46-cm branch tip	Surviving pupae per 46-cm branch tip	Population reduction due to treatment (%)	1982 Defoliation (%)
Barbara Lake SPA	wS	31.0	1.4	83	19
Check	wS	27.7	7.1		43

POOR

QUALITY

ORIGINAL